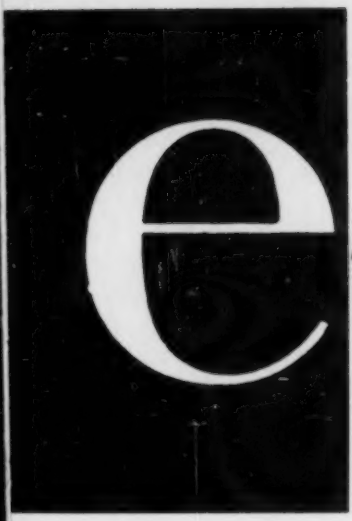

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1959

Vol. 6 December 1959 No. 4

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Report of An Ecumenical Study Group

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Fritz A. Freyhan, M.D.

American Eugenics Society, Inc.

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Vol. 6, No. 4, December, 1959 *Eugenics Quarterly*

RESPONSIBLE PARENTHOOD AND THE POPULATION PROBLEM*

Report of a Special Ecumenical Study Group

I
THE CONTEMPORARY SETTING

1. It has become a truism to speak of a world in crisis. The struggle for self-determination, for dignity and freedom of peoples round the globe, the economic and technological revolution and the emerging of a world-wide industrial society, these are a few of the facts with which we must learn to live.

2. The larger crisis of our time is reflected in families throughout the whole wide earth. Different regions and different nations produce varying problems, but nowhere is the family unaffected. It, too, is in crisis. The emancipation of women and the growing acceptance of partnership between men and women are revolutionizing the previously masculine-dominated social structures which now appear so patently unjust. Under pressures within and without, age-old patterns of family relations are disintegrating on every side. Out of the ruins of the old must be built the new, but built on foundations of respect and dignity and freedom, not of servitude, injustice and conflict.

3. The rapid movement and extension of much-needed public health programs in all continents are bringing dramatic reductions in death rates, particularly in areas where high fertility has hitherto been offset by a tragically high mortality. The world confronts a doubling of the present number of people before the end of this century and is presently experiencing an annual increase of 50 million persons. While the effects of the mounting population pressures are felt throughout the world, the main thrust is occurring in the economically less developed regions of the earth, and indeed may be intensified by the first stages of industrialization. The crisis here stems less from the size of the human increase in relation to potential resources than from the rapidity of the increase in relation to the present and practicable rate of development of available resources.

* Twenty-one members and consultants from the main confessions of the World Council of Churches and the International Missionary Council prepared this report. Dr. Richard M. Fagley acted as secretary of the group. The report does not represent the official view of the World Council of Churches nor the I. M. C. but has been issued as a document for study and comment. Reprinted by permission from the October 1959 issue of *The Ecumenical Review*, a quarterly published by the World Council of Churches in Geneva, Switzerland.

4. The social, political, economic and even religious repercussions of this population explosion are vast and grave. Its shock waves buffet countless human families. Nor is there an easy or quick solution to this crisis. Indeed, it seems probable that only a wise combination of vigorous economic and social development aided by substantial technical and financial assistance, the easing of certain pressures by means of migration, the wide development of education, as well as the extension of "family planning" can hope to offer an acceptable answer.

5. Living in such a world and confronted with such problems the Church bears her continuing witness that God is at work, as He has been since the dawn of creation. The Church has survived past times of troubles and stands fast in faith toward the future. The concern of Christian faith for the family is not a new one, born out of the travail of the present. From the very beginning the Church has seen itself as the Family of families, and has known that the Christian witness is necessary and effective in the home, in the relationships between husband and wife, between parents and children. Throughout the centuries Christians have sought to relate the eternal truths of the Gospel to the problems and perils of their times. Yet it must be confessed that in the past Christian thought has, especially in the area of the family and its relationships, often clung to tradition without taking into account new knowledge. In the current age, God is calling upon us not to desert the eternal Christian truth but to apply it to the changing circumstances of the modern world.

6. We recognize the wide dimensions of the challenge, social, political, economic, medical and educational, and we welcome the fact that various agencies, national and international, are devoting their attention to them. Responsible parenthood does not in itself provide a solution to all problems of social and economic development, including the certainty of rapidly increasing world population. The application of science and technical progress in agriculture and industry and the maintenance of peace and international cooperation will have to play a major role. On the other hand, no acceptable solution seems in sight without responsibility taken by individual parents. In this short report, we attempt to offer what seems to us some fundamental Christian principles on which those who are in Christ may base their personal decisions in faith and not in fear. The family embodies the most intimate of all personal relations and has a rightful privacy of its own, but in these days of annihilated distances and common cause the Christian family must open itself to the wider claims of the world and learn to live responsibly in the love of God, the grace of our Lord Jesus Christ and the communion of the Holy Spirit.

II

CONTRIBUTIONS TOWARD AN ECUMENICAL CONSENSUS

7. We have been impressed and encouraged by the evidence of a growing sense of responsibility for the family on the part of churches and councils in the ecumenical movement. Within the past decade there have been a number of important statements on Christian marriage and parenthood and additional studies are being undertaken.

8. Particular reference should be made to the 1958 Lambeth Conference Report and related resolutions, on *The Family Life in Contemporary Society*, and to the preparatory volume under the same title. The ecumenical movement as a whole is indebted to this undertaking for the serious way in which the problems of the family have been approached and for the substantive contribution made to a Christian response.

9. The degree of agreement found in the available statements of various communions is striking, and indeed significant in terms of a prospective consensus within the ecumenical movement. Yet we are also mindful of the partial character of the evidence so far received. Our information is incomplete, and the known silence of important Christian bodies may have diverse meanings. We have in mind in this connection the Orthodox Church, the churches and councils in many parts of Asia, Africa and Latin America, churches in communist countries, as well as some of the churches in the West. The action of the World Council of Churches' Central Committee at Galyateto (1956) in recognizing the need for more serious ecumenical consideration and study of the population problem, and the related question of family planning, is still highly relevant.

10. These facts, however, do not minimize the import of the beginnings that have been made. The combined testimony of the churches that have spoken provides a thesis for future ecumenical study and action. It may be well to note briefly a few of the recurrent themes in the statements at hand, which indicate their common tenor.

There is repeated stress on the spiritual character of true matrimony, expressed in physical union and transcending it. The "two become one" is part of God's grace, to be accepted as a mystery and lived in faith.

The family likewise is surrounded by grace. Children are the gift of God, and procreation is sharing in God's creation.

Christian marriage and family life are consequently described in terms of responsibility; the mutuality of husband and wife, the loving care of parents for children, the love and respect of children for parents, the duties of the family in the service of society, the obligations of all to God and His Church. There is repeated emphasis on the applicability of principles of stewardship to procreation within the marriage bond, and on the duty of the Church to inculcate such principles.

True marriage and parenthood are seen at the same time to be part of the realm of Christian freedom. This means freedom from sensuality and selfishness which enslave. It also means considerable latitude of choice, when the motives are right, in regard to mutually acceptable and non-injurious means to avert or defer conception. Marital freedom, indeed, is the pre-condition of marital responsibility.

11. The principles embodied in the available statements provide significant material for further work by the churches, councils and agencies of the ecumenical movement. To aid that process, we advance considerations which, despite possible differences as to detail, and except as noted below,[1] find general assent among the members of this study group.

III

THE MEANING OF RESPONSIBLE PARENTHOOD

12. Marriage as a divine institution can be described in Biblical terms as a covenanted relationship within which man and woman receive the grace, security

[1] The historic and doctrinal position of the Orthodox Church necessitates, at certain important points, a different approach to this subject from that reflected in the general course of this statement. The Orthodox member of the group, while sharing the concern of the group and contributing fully to its deliberations, drew attention to "the different teaching and practice of the Orthodox Church, which holds that parents have not the right to prevent the creative process of matrimonial intercourse; also, that God entrusted to them this responsibility for childbearing, with full confidence that His Providence would take care of material and other needs."

and joy promised by God to those who are faithful to it. Marriage is the "great mystery" which yet illumines for men the covenant or marriage of Yahweh with Israel (*Hosea* 2:19f.), and of Christ with His Bride, the Church (*Ephesians* 5:23-33, *Revelation* 21:9; 22:17).

13. The Christian marriage relationship is a covenant, entered into with sacrifice in the joyful giving of each to other; it is confirmed by the exchange of vows to which God's promised blessing is attached; it has its own rules or commandments related by God's ordinance to the nature of man and woman and to the relationship between them. Like every other part of human life, it is redeemed by Christ, it is preserved by His forgiveness, it is enriched beyond human measure by the Holy Spirit dwelling in the husband and wife as members of the Body of Christ, the Church.

14. Thus the covenanted relationship of husband and wife within marriage, is, in the purpose of God, one of total commitment, a total giving of self and a total acceptance of the other, resulting in a union, spiritual and physical, described in the Bible as becoming "one flesh." The terms of this union are not those of a human contract. In the Biblical narration the ordinance of marriage is integrated with the very creation of man and woman as such; so its terms, as given by God, are proper to the nature of man and woman, and to the nature of their union. Companionship and parenthood are therefore established together as the purposes of marriage from the beginning, with sexual union as the ordained servant of both. Marriage has its fullness where both are attained (*Gen.* 2:18-25; *Matt.* 19:4 ff; 13ff.)

15. The social, cultural and economic circumstances surrounding marriage and family life vary widely from region to region and from age to age. The formation of the family, and of companionship within it, varies accordingly; so does the area of life open to personal decision. The gift of dominion to mankind, within the created order of which mankind is part (*Gen.* 1:28), reinforced by the command to man to love the Lord God with all his mind (*Luke* 10:27), calls upon us to extend this area of decision in humble accordance with our knowledge. Knowledge is thus a liberating gift of God, to be used for the glory of God, in accordance with His will for men. Such use of improved medical knowledge has brought a drastic reduction of infant mortality, and this is to be accepted gratefully as coming from God; at the same time it affects deeply the size of the family and the rate of population growth and has therefore created a new area for responsible decision.

16. Our concern is therefore with the responsible use of knowledge in family life, particularly in relation to the procreation and nurture of children. A knowledge of the relation of sexual love to the procreation process gives to a couple the power, and therefore the responsibility, to lift the begetting of children out of the realm of biological accident, or "fate," into the realm of personal decision—which is also the realm of grace, where man is free to wait upon God and consciously to respond to His will. Carried further, it enables husband and wife to decide, within the Providence of God, whether any one act of intercourse shall be for the enrichment or expression of their personal relationship only, or for the begetting of a child also.

17. That these two purposes of the act are thus separable, within the divine ordinance of the marriage covenant, is evident from the nature of the act itself, which is known to fulfill the first when it is incapable of fulfilling the second, either through sterility, or in times of periodic infertility and after the age of

childbearing in woman. Sexual intercourse within marriage has in itself a goodness given by God, even when there is neither the possibility nor the immediate intention to beget children.

18. Given this responsibility of choice, founded upon knowledge, what considerations are to guide a Christian husband and wife in the exercise of it? They would surely begin with the general ordinance of God for the marriage covenant, integrating the power of parenthood with the expression of sexual love; so parenthood will be normal and right for them, unless there are specific and compelling indications against it, as, for example, a valid threat to the wife's life or health.

19. This obligation—or fulfillment—accepted, the questions may remain, "How many children?" "At what intervals?" Here the considerations involve:

(a) *The integrity of the marriage*—every decision should be a joint one of husband and wife, made in faith and prayer and after deliberation in love.

(b) *The claims of children as persons in their own right*—they are to be valued, not primarily as economic or social assets or even to assure the comfort of parents in old age or (as is believed in some Asian societies) their beatitude after death; but as persons with a right to parental care in infancy and youth and to a proper equipment from society to serve God fully in it themselves.

(c) *The witness of a Christian family in society*—the Christian family, as a cell in the Body of Christ, has a unique vocation and power to exhibit the fruit of the Spirit, often in what are humanly regarded as the most adverse physical conditions—a witness especially needed in a non-Christian or sub-Christian society. To say this is in no way to deny the complementary witness of celibacy, to which the Christian life adds new power and significance in many societies.

(d) *The needs of the social order of which the family forms part*—there are factors of special urgency in regions where a rapid multiplication of population coexists with poverty, insufficient supplies of food and other necessities of life, and a low potential for rapid economic development; responsible parenthood has to take account of these.

(e) *Church tradition*—When deciding in conscience, Christians would have proper regard to the teaching or tradition, if any, of their own church, and then offer their own decision to God in faith.

20. What considerations should guide parents in the means they employ for the responsible exercise of their procreative power? Responsible parenthood begins with responsible marriage. Biological maturity alone is not the only criterion of readiness for marriage. Life in the Christian community ought to have prepared the young man and woman to raise their sexual relationship above the domination of mere biological impulse, and to have dominion over it. Further, in the life of grace, not only chastity before marriage but also periodic continence within it, when freely accepted by both the spouses, are virtues of positive worth attainable by Christian people.

21. But this is by no means the whole of the answer. The extremely high rates of abortion in many regions, Eastern and Western, with their toll of human suffering and violation of personality, testify to a tragic determination among parents to find some means, however bad, to prevent unwanted births. The Christian conscience cannot approve of abortion, involving as it does the de-

struction of human life—unless, of course, the termination of a pregnancy is necessary to save the life of the mother.

22. "Life," however, does not begin until the sperm has fertilized the ovum and conception has taken place. Knowing this, what means may Christians properly employ to prevent an individual act of intercourse from resulting in conception? Granted that the attempt may rightfully be made, there appears to be no moral distinction between the means now known and practised, by the use whether of estimated periods of infertility, or of artificial barriers to the meeting of sperm and ovum—or, indeed, of drugs which would, if made effective and safe, inhibit or control ovulation in a calculable way. It remains that the means employed be acceptable to both husband and wife in Christian conscience, and that, on the best evidence available, they do neither physical or emotional harm. Here we would quote some words of a Committee of the Lambeth Conference of the Bishops of the Anglican Communion of 1958:

> "It must be emphasized once again that family planning ought to be the result of thoughtful and prayerful Christian decision. Where it is, Christian husbands and wives need feel no hesitation in offering their decision humbly to God and following it with a clear conscience. The *means* of family planning are in large measure matters of clinical and aesthetic choice, subject to the requirement that they be admissible to the Christian conscience. Scientific studies can rightly help, and do, in assessing the effects and usefulness of any particular means; and Christians have every right to use the gifts of science for proper ends.'

23. In conclusion we may quote also Resolution 115 of the same Conference, based on the report of this committee:

> "The Conference believes that the responsibility for deciding upon the number and frequency of children has been laid by God upon the consciences of parents everywhere: that this planning, in such ways as are mutually acceptable to husband and wife in Christian conscience, is a right and important factor in Christian family life and should be the result of positive choice before God. Such responsible parenthood, built on obedience to all the duties of marriage, requires a wise stewardship of the resources and abilities of the family as well as a thoughtful consideration of the varying population needs and problems of society and the claims of future generations.'

24. It is to be observed that such deliberation, and such estimation of human, spiritual and social values, as has been outlined above, is well nigh impossible in some of the regions where they are most urgently required. Where there is grinding poverty, a high birth rate, high death rate and high infant mortality, a fatalistic attitude to death is almost inevitable, and a high valuation of human personality is difficult to attain. Christians in wealthier regions have a duty to ponder and to act upon this truth in order to help their fellows in less developed lands toward conditions in which they can enjoy the freedom to make personal decisions of this sort, and to exercise responsible parenthood for themselves. To secure this help, the Christian is led by his faith to consider such matters as the need for capital investment and hence his opportunities as a citizen for political action. The command to love thy neighbor as thyself (*Levit.* 19:18; *Luke* 10:27) is thus relevant at all points: it defines the duty of spouse to spouse; of parents to their children and of children to parents; of families to other families in society; of churches to churches; and of nations to nations.

SCHIZOPHRENIC FAMILIES
Potential Effects of Modern Treatment Methods*

FRITZ A. FREYHAN, M.D.
Department of Psychiatry
University of Pennsylvania and
Delaware State Hospital

A DISCUSSION OF THE EFFECTS OF MODERN therapies on schizophrenia is bound to be controversial, not only because of the discrepancies in reported results but in view of the extreme polarities of etiological concepts. I have always been convinced and the Second International Congress for Psychiatry which was entirely devoted to schizophrenia did much to strengthen my belief that many conflicting concepts stem substantially from dissimilar clinical experiences. The panorama of clinical and social manifestations of schizophrenia is extremely wide. A comprehensive concept of schizophrenia requires therefore a study of schizophrenic patients which is neither limited in the dimension of time nor confined to the selection of particular groups of schizophrenics. The mere intensity of personal therapeutic involvement with selected schizophrenic patients for a year, or even several years, cannot provide the same panoramic view of schizophrenia as prolonged experience in psychiatric hospitals with unselected patient populations.

What seems distressing is the evidence of orientational provincialism which permits a given group, be it a university department, a research institute or a hospital, to feature images of schizophrenia which are totally unrelated to valid findings from other quarters. Thus, schizophrenia is taught to be a biochemical deficiency in one place but is regarded as a love-deprivation state elsewhere; and while genetic data are carefully documented by experts, extrabiologic transmission is vigorously proclaimed by schools of interpersonalism. Although divergent positions must exist side by side to await scientific confirmation or disproof, progress may be impeded by the professed disinterest of some groups in the investigative evidence of their opponents. As scientists, university teachers and physicians, we should be alarmed by the fact that a substantial number of our medical students are not only not exposed to the complexity of pertinent approaches to schizophrenia but are indoctrinated to accept preferred hypotheses as facts.

Eugenic approaches to psychiatric family problems depend on the knowledge of the applicability of principles of human genetics to mental health. Kallmann states: "In promoting general recognition of genetic phenomena in man as a potent safeguard of public health, now and in the future, the discipline of psychiatric genetics will need the help of the scientist as well as the social worker, of the psychologist as well as the statistician, of the specialist as well as the family physician." (Kallmann, 1953) Whether or not one wishes

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to agree with the principles of eugenic methods on grounds of social philosophy, one cannot hesitate to promote a deeper understanding of the implications which human genetics has for all schools concerned with mental health and disease.

I speak to you as a clinical psychiatrist. My knowledge of the applicability of genetic principles is minimal at best. But I have never believed that a productive study of schizophrenia can be achieved without an awareness of, and inquiry into, the complexities of genetic aspects. Perhaps it was easier for me than for many of my colleagues to wonder about the potential significance of genetic influences because of the particular circumstances under which my clinical experience and my investigative work developed. For two decades, I have studied, diagnosed and treated schizophrenic patients at Delaware State Hospital. As the only psychiatric hospital for the entire state, its population includes patients from all socio-economic classes, from urban and rural areas, of varied ethnic background, referred as private cases or committed by family physicians, psychiatrists or social agencies. Due to the absence of other psychiatric in-patient services in the state, patients have always been admitted as soon as they were recognized to be in need of hospital treatment. Multiple hospitalizations during the life of patients meant, with few exceptions, readmission to Delaware State Hospital. Under these circumstances, the usual difficulties which arise from selective factors in the composition of hospital populations are reduced to the very minimum. This eliminates many clinical and social factors of selection which diminish the significance of findings from a single hospital. The smallness of the state permitted close contact between the hospital, the patient and the patient's family. Since 1940, I have personal knowledge of all hospitalized schizophrenic patients.

To overlook the concurrence of schizophrenic psychoses or other mental disorders in particular families would have been difficult indeed. In many case histories I found references to previous admissions of other members of the family. Moreover, there were many revelations on visiting days when one visitor would inquire about his mother, his brother and cousin; or about his brother and sister; or, in the case of parents, about their two or three children. Nevertheless, it required the organizaiton of a special investigative unit to explore as completely as possible the representation of families in the total clinical population. Needless to say, this is not a static material. On the contrary, new aspects unfold from day to day as either the size of a family or the number of families increases in accordance with new admissions.

I believe that my experience with schizophrenic patients and their families has saved me from the temptation to subscribe to particularistic concepts on the nature and origin of schizophrenia. Variation and variability of the manifestations of schizophrenia make it seem unproductive to reduce highly complex matters to simple conceptual models. I shall make an attempt, therefore, to assess the potential effects of modern treatment methods on course and outcome of schizophrenia in families with multiple cases. An analysis of mating and fertility trends will have to be deferred until the resulting social impact is clearly understood. One should also keep in mind that the composition of this clinical material is based on actual hospitalized cases. No efforts have been

TABLE I

DISTRIBUTION OF SCHIZOPHRENICS IN 69 FAMILY UNITS

Number Schizophrenics Per Family	*Total Number of Mentally Ill Per Family* 8	7	6	5	4	3	2
6			1				
5	1						
4				2	3		
3	1	1			3	12	
2				1	4	8	32

made to correct for procedural bias since it was not intended to obtain a representative sample with regard to the familial incidence of schizophrenia.

SCHIZOPHRENIC FAMILIES

There are 157 families with 2 or more members in the hospital population of which one or more in each family is a schizophrenic. For this presentation, I have selected those 69 families in which 2 or more members are known to be schizophrenic. These 69 families comprise 208 individuals, 172 of whom are schizophrenic (72 men, 100 women). Table I illustrates the distribution of family units in relation to their proportional share of schizophrenic members.

TABLE II

CONSTELLATIONS OF FAMILY RELATIONSHIPS

I				II								III			
Grandparent Parent Child	*Grandparent Grandchildren*			*Both Parents* With Specified Number Children				*One Parent* With Specified Number Children				*Siblings*			
1	1	2	5	1	2	3	4	1	2	3	4	2	3	4	5
1	1	2	1	1		1		6	7	2	1	25	3	1	1
Specified Relationships Plus Additional Members															
				1				4	2			9	1		

A family unit is here defined as the total number of mentally ill members for each family. The specially marked squares designate those family units in which all mentally ill members are schizophrenics. All schizophrenics were or are hospitalized: 158 in the Delaware State Hospital and 14 in psychiatric institutions outside of Delaware. For each of these 14 patients, case abstracts and diagnostic summaries were obtained for review.

Table II discloses the primary constellations of family relationships. This arrangement may not only seem arbitrary but useless for genetic analyses. For the purpose of clinical and social evaluations, however, I consider it important to identify the variety of constellations in this manner. Emphasis is placed on primary constellations rather than on total representation of all occurring variations. The main purpose of this arrangement is to indicate the cleavage between common and different family environments.

The first group consists of families with a grandparent. In one family, this involves grandparent, parent and child. There are also 4 families with a grandparent and 1 to 5 grandchildren. The second group includes all families with parent-child constellations. A breakdown is presented on 2 levels: the upper level referring exclusively to parent-child constellations, the lower level to parent-child constellations plus additional family members such as aunts, uncles and cousins. This horizontal division tells us at a glance whether or not one or several family environments are involved for clinical and social evaluations. If the family is defined genetically, such a division is obviously pointless. In the light of predominating psychosocial concepts of family, which center attention on the dynamics of interaction in the family, it seems valuable to elaborate on the dissimilarity of intra-familial environments in many of these families. This becomes evident when we turn our attention to those two families which have in common that both parents were Delaware State Hospital patients. One family consists of the parents, their son and 2 daughters. The mother was uninterruptedly hospitalized for over 30 years, remaining mute and totally unresponsive until her recent death. The father was recently admitted in a state of advanced senile psychosis. Being a frequent visitor to the hospital through 3 decades, he had been known to be a somewhat eccentric, self-centered and suspicious person. Three of their 6 children developed schizophrenic psychoses. The son, continuously hospitalized since 1935, has been seclusive, apathetic and dominated by bizarre delusions of persecution. One daughter was first admitted at the age of 37. Though single, shy and given to irrational fears, she had steadily supported herself in domestic work, keeping her last job for 17 years. Her psychotic state was characterized by bizarre somatic and persecutory delusions with obvious hebephrenic features. She left the hospital after 5 months in markedly improved condition and has again been self-supporting for over three years. The other daughter, also single, was admitted at the age of 23 and readmitted 16 years later. Hospitalization lasted less than three years on both occasions. While self-supporting and fairly energetic, she has always displayed features of paranoid grandiosity which completely disrupted her capacity for realistic thinking during the two periods of hospitalization. Looking at this family, one may detect persuasive evidence for Lidz's hypothesis of "the transmission of irrationality." (Lidz, 1958)

The other family consists of both parents, their daughter and the father's niece. The mother, a rather active, optimistic and friendly person, was hospitalized at the age of 56 for what appeared to be an involutional depression from which she recovered in 3 months. Her husband was admitted at the age of 83 with symptoms of cerebral arteriosclerosis. He died 2 months after admission. He had been a domineering and jealous individual who fluctuated between affection and intolerance for the problems of his wife and children. There were six children of whom two died in infancy. While 3 grew up normally, established themselves and have their own families, the oldest daughter was admitted at the age of 22. She has been continuously hospitalized since. During these years, she has remained apathetic, distant and oddly stereotypical in all of her activities. Her cousin, i.e. her father's niece, was admitted at the age of 22 in 1913. She remained continuously hospitalized until her death in January, 1958. She was the youngest of four children, all of whom are married and moderately successful in their personal lives. Her father was a quiet, determined and rather humorless man who seemed, however, devoted to his family. When close to 50 years, he lost his position and became discouraged and moody. He died at the age of 81. The mother impressed people as a harmonious person with varied social interests. She also died in her eighties. The schizophrenic daughter in this family stands out in my memory as the most absurdly deteriorated schizophrenic patient I have ever seen. Quiet, sensitive and somewhat self-conscious as a teenager, she became inconspicuously more passive and bizarre in thoughts and behavior as she approached the twenties. From the time of admission, she progressed to a state of total withdrawal and assumed never-changing stereotypical postures. Invariably sitting in the same rigid position, she mumbled hardly audible and unintelligible syllables while grimacing, shaking her head and pulling her hair. During her 44 years of hospital existence, she depended on nursing care for survival. She finally died of bronchopneumonia and cachexia.

In contemplating the occurrence of schizophrenia in this family unit, we are struck with the existence of 2 totally dissimilar environments. Whatever deficiencies in family interaction may be assumed, will be of little relevance to the severity of the psychoses. Moreover, interpretations of the schizophrenic psychoses of these cousins in terms of "pseudo-heredity," attributable to "patterns of sharing and contagion" as postulated by Ehrenwald (1958), would make excessive demands on one's willingness to go beyond the limits of psychological common sense.

One family, listed under the constellation one parent-one child, actually includes a double feature, namely 2 cousins and their sons. This is an 8-member family unit with 3 schizophrenics. In as far as intrafamilial environments are concerned, we have to account for six markedly different sets. Families such as these may constitute the backbone of genetic theories; they should also be studied by those investigators who concentrate their attention too exclusively on analyzing symbiotic aspects.

In group 3 we find families which are represented by siblings, ranging from 2-5 in number. Siblings with additional relatives from collateral families are tabulated on the lower level. One of these sibling families, about which I reported previously, (Freyhan, 1951) consists of 4 schizophrenic siblings of whom 3 were brought up in this country while

the fourth remained under the care of relatives in Poland when the family came to the United States before the first World War. She joined her family after the second World War, after 40 years of uninterrupted separation. Within a year after her arrival in this country, she was admitted to the Delaware State Hospital, as were one brother and 2 sisters from whom she had been apart through most of her life. Paranoid and catatonic features predominate in their psychotic states. We can find in this family an impressive array of genetic, psychodynamic and sociological aspects which I cannot explore in this presentation. In spite of important individual differences in the course of the psychoses, all 4 have been continuously hospitalized and must be regarded as therapeutic failures. Their exposure to totally different life situations must be a matter of considerable interest.

Only with difficulty can I resist the temptation to sketch several psychological portraits of these fascinating sibling families. But the question will be asked: "What about their parents and the family milieu from which they came?" I can only state categorically that the various aspects which are believed to be instrumental in the genesis of schizophrenia emerge from the study of these families in both: their significance and their limitations. The truly kaleidoscopic picture poses a challenge to all who tend to reduce etiological complexity to biological, psychosocial or psychoanalytical formulas. There are no apparent common denominators which lend support to monistic theories. Some of these siblings came from sick and disturbed families while others did not. In many instances, family relationships were found to be significantly pathological. Yet, in these same families, we may find a schizophrenic cousin, aunt or uncle coming from what must in all fairness be considered average families. Lidz attributes great significance to the "training in irrationality" as a potent determinant in spreading schizophrenia in families (Lidz, 1958). His studies are based on 15 families with one hospitalized schizophrenic offspring. From a research point of view, some questions must arise with regard to his belief that "they form a good random sampling of middle- and upper-class families with schizophrenic offspring." Prout and White (1956) compared the early life experiences of schizophrenics with those of their healthy siblings. While finding no evidence that the schizophrenic patient suffered more trauma from poor environmental influence, they did find evidence that he reacted pathologically to ordinary changes. These authors concluded that their findings "suggest a radical change in therapeutic theory which has assumed that the illness has been a product of poor environmental influence, rather than an early pathological reaction to the environment on the part of the patient."

Irrational, schizoid and other pathological personalities predominate undoubtedly in families of schizophrenic patients. Psychosocial etiological concepts presuppose the existence of a pathological intra-familial environment in the families of all schizophrenic offspring. But the very obvious variation in the structure of family environments of the sibling families proves this to be a convenient oversimplification. I venture to say that if nothing would be known about genetic theories of schizophrenia, the feasibility of some predisposing factors would soon enough emerge as a compelling idea in the minds of those who investigate representative samples of schizophrenic families.

TABLE III

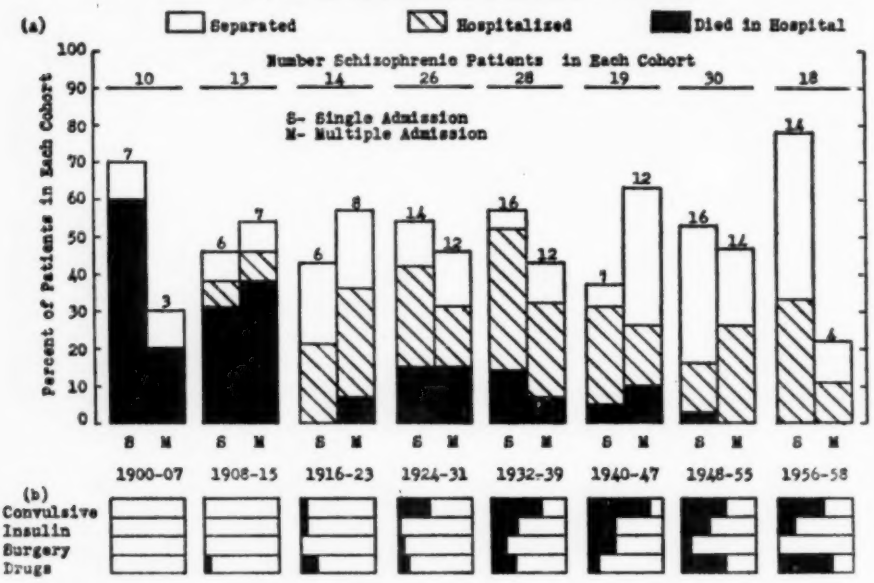
(A) COHORT ANALYSIS OF STATUS OF 158 SCHIZOPHRENIC PATIENTS ON 1-1-59 AND (B) DISTRIBUTIONAL ANALYSIS OF SOMATIC THERAPIES

	Period of Admissions and Number of Patients in Each Cohort													
	1900-07 10		1908-15 13		1916-23 14		1924-31 26		1932-39 28		1940-47 19		1948-55 30		1956-58 18	
	Single Admissions															
	Number and percent of patients in each cohort															
Dead	6	60.0	4	30.8	–	—	4	15.4	4	14. 3	1	5.3	1	3.3	–	—
Hospitalized	–	—	1	7.7	3	21.4	7	26.9	11	39.3	5	26.3	4	13.3	6	33.3
Separated	1	10.0	1	7.7	3	21.4	3	11.5	1	3.6	1	5.3	11	36.7	8	44.4
Total	7	70.0	6	46.2	6	42.9	14	53.8	16	57.1	7	36.8	16	53.3	14	77.8
	Multiple Admissions															
Dead	2	20.0	5	38.5	1	7.1	4	15.4	2	7.1	2	10.5	–	—	–	—
Hospitalized	–	—	1	7.7	4	28.6	4	15.4	7	25.0	3	15.8	8	26.7	2	11.1
Separated	1	10.0	1	7.7	3	21.4	4	15.4	3	10.7	7	36.8	6	20.0	2	11.1
Total	3	30.0	7	53.8	8	57.1	12	46.2	12	42.9	12	63.2	14	46.7	4	22.2

SOMATIC THERAPIES

	Convulsive		*Insulin*		*Surgery*		*Drugs*	
Cohort	No.	%	No.	%	No.	%	No.	%
1900-07	–	—	–	—	–	—	–	—
1908-15	–	—	–	—	–	—	1	7.7
1916-23	1	7.1	1	7.1	–	—	3	21.4
1924-31	11	42.3	1	3.8	2	7.7	4	15.4
1932-39	19	67.9	10	35.7	6	21.4	9	32.1
1940-47	16	84.2	7	36.8	7	36.8	3	15.8
1948-55	18	60.0	11	36.7	4	13.3	18	60.0
1956-58	11	61.1	4	22.2	–	—	13	72.2

Fig. 1. (a) COHORT ANALYSIS OF STATUS OF 158 SCHIZOPHRENIC PATIENTS ON 1-1-59, AND (b) DISTRIBUTIONAL ANALYSIS OF SOMATIC THERAPIES.


(a)
Separated
Hospitalized
Died in Hospital
Number Schizophrenic Patients in Each Cohort
10 13 14 26 28 19 30 18
S- Single Admission
M- Multiple Admission
Percent of Patients in Each Cohort
100 90 80 70 60 50 40 30 20 10 0
7 3 6 7 6 8 14 12 16 12 1 12 16 14 14 4
S M S M S M S M S M S M S M S M
1900-07 1908-15 1916-23 1924-31 1932-39 1940-47 1948-55 1956-58
(b)
Convulsive
Insulin
Surgery
Drugs

THERAPEUTIC ASSESSMENT

For the discussion of prognostic and therapeutic aspects, I offer an analysis of the developments which concern the 158 schizophrenic patients who were, or are, hospitalized at the Delaware State Hospital. These patients are divided into 8 cohorts. All but the last cohort include admissions during 8-year periods. All data pertain to each patient's status on 1/1/59. Each cohort is divided on the basis of single or multiple admissions.

The cohort analysis, as presented in Table IIIA, enables us to compare the developments in relation to different eras of therapeutic management. In a previous study, I presented an analysis of the total number of schizophrenic patients who were admitted to the Delaware State Hospital in the years 1900-1950 (Freyhan, 1958). This enables me to compare the family group with the total sample of 1488 hospitalized schizophrenic patients.

The single admission column for each cohort is most apt to provide information on the best and worst prognostic aspects. These patients were admitted only once: to improve, leave and never to return; or to remain continuously hospitalized. Patients with multiple admissions either reached a sustained level of improvement and separation or required later continuous hospitalization. We observe a growing rate of separations, ranging from 20 per cent for the first cohort to over 50 per cent in the last two cohorts. The increasing size of the later cohorts would seem to be an indication of the growing number of total admissions over half a century. A comparison of this family sample of schizophrenics with the previously reported cohort data for the total population of hospitalized

schizophrenics reveals the following differences. While in the total sample of 1488 schizophrenic patients multiple admissions increased in proportion to the growing number of separations, this does not hold true for the family cohorts. Secondly, and more significant, the proportion of total separations for the family sample is lower than that of the total sample. This suggests that the prognosis for the family schizophrenics is generally less favorable.

Table IIIB presents a distributional analysis of the major somatic therapies. Convulsive methods (at first Metrazol, then ECT), insulin treatment and psychosurgery, have been available at the Delaware State Hospital since 1938. Pharmacotherapy, which refers here exclusively, to neuroleptic treatment, commenced in 1954. As is evident, many of the patients admitted prior to the era of somatic therapies received one or several of these treatments during the later stages of their illness. For example, 42.3 per cent of the cohort admitted between 1924 and 1931 received one or several types of treatment. As would be expected, we find evidence of a considerable increase of therapeutic activities in all of the cohorts admitted since 1932. Electroconvulsive therapy maintains the first place in all but the last cohort in which pharmacotherapy surpasses by a slight margin. There is a decrease of insulin in the last cohort. None of the patients admitted since 1956 had psychosurgery. It should be pointed out, however, that psychosurgery has never been performed before all other therapeutic methods had been given a thorough trial. Many of the patients in the last 3 cohorts had psychotherapy. But differences in methods and extensiveness of treatment require a special analysis. Psychotherapy is, therefore, excluded since it does not lend itself to a comparative tabulation with the more uniform somatic methods.

Before attempting to assess the potential influence of these treatments on the patients with whom we are here concerned, I must briefly refer to an analysis of general impact of somatic therapies on the group of schizophrenias. (Freyhan, 1958) The discrepancies between lifelong deterioration in some and temporary illness followed by lifelong readaptation in other schizophrenics induced Eugen Bleuler to develop the concept of the group of schizophrenias. Common clinical manifestations on one hand, and consistent differences in prognostic patterns on the other, suggest the existence of particular groups within empirically established generic boundaries. Evaluations of the effectiveness of therapeutic methods must take these differential patterns into consideration.

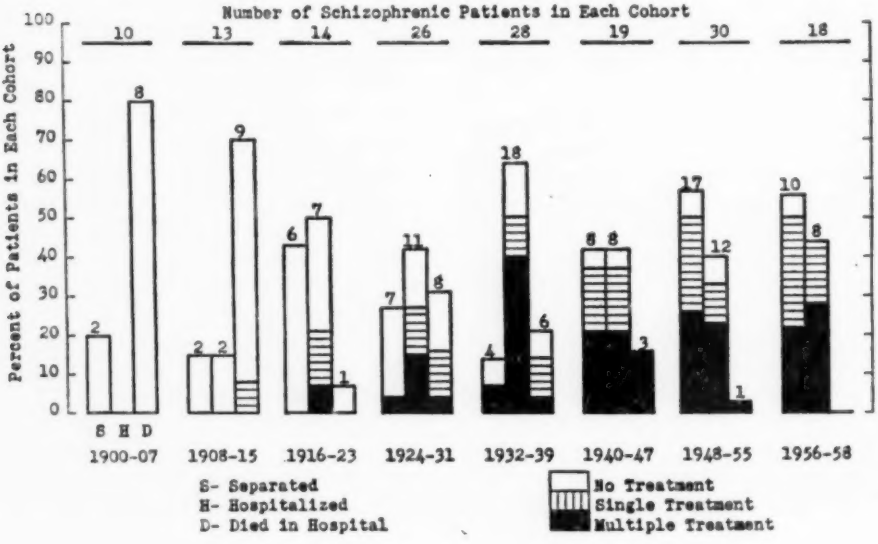
Bleuler's group concept finds support in the analysis of the total schizophrenic population admitted to the Delaware State Hospital between 1900 and 1950. What is evident, at least clinically, is the fact that schizophrenia manifests itself as a temporary, a recurring and a progressive disorder. Modern treatments have greatly enhanced the chances for clinical improvement, hospital separation and adequate social readaptation. This is not to ignore the fact that social attitudes toward schizophrenic patients have also undergone a profound change which favor more permissive discharge policies. Thus, both modern therapeutic methods and increased social tolerance of schizophrenic individuals have been effective in speeding up the separations from the hospital. But while mortality of hospitalized schizophrenics has drastically diminished, and while the more chaotic aspects of psychotic behavior have yielded to therapeutic modification, there remains the distressing fact of

TABLE IV

THERAPEUTIC ASSESSMENT

		Treatment					
		None		Single		Mulitple	
		No.	%	No.	%	No.	%
1900-07	*10*						
Separated	2	2	20.0				
Hospitalized	—	–	0.0				
Dead	8	8	80.0				
1908-15	*13*						
Separated	2	2	15.4				
Hospitalized	2	2	15.4				
Dead	9	8	61.5	1	7.7		
1916-23	*14*						
Separated	6	6	42.9				
Hospitalized	7	4	28.6	2	14.3	1	7.1
Dead	1	1	7.1				
1924-31	*26*						
Separated	7	6	23.1			1	3.8
Hospitalized	11	4	15.4	3	11.5	4	15.4
Dead	8	4	15.4	3	11.5	1	3.8
1932-39	*28*						
Separated	4	2	7.1			2	7.1
Hospitalized	18	4	14.3	3	10.7	11	39.3
Dead	6	2	7.1	3	10.7	1	3.6
1940-47	*19*						
Separated	8	1	5.3	3	15.8	4	21.0
Hospitalized	8	1	5.3	3	15.8	4	21.0
Dead	3	–				3	15.8
1948-55	*30*						
Separated	17	2	6.7	7	23.3	8	26.7
Hospitalized	12	2	6.7	3	10.0	7	23.3
Dead	1					1	3.3
1956-58	*18*						
Separated	10	1	5.5	5	27.8	4	22.2
Hospitalized	8			3	16.7	5	27.8
Dead	—						

Fig. 2, THERAPEUTIC ASSESSMENT



therapeutic failure in about one-third of all schizophrenic patients. A direct influence on the prognosis cannot be ascertained since we lack sufficient knowledge about the natural history of schizophrenic psychoses. On the basis of available evidence, there is a group with a favorable as well as one with an unfavorable prognosis. Modern treatments have neither produced the former nor, however, eliminated the latter.

A therapeutic assessment is undertaken in Table IV. Each cohort has been divided into 3 bars: one for separated, one for hospitalized and one for deceased patients. Superimposed on each of these bars is a breakdown of therapeutic activities. It is not intended to evaluate the relative merits of each therapeutic modality. What seems important here, is to relate therapeutic activity in terms of single or multiple treatments, or the absence of treatment, to patterns of course and outcome. That it is not easy to establish correlations between therapeutic activities and favorable or unfavorable groups is indicated by the 1940-1947 cohort which shows an equal distribution of therapeutic activities in separated and hospitalized patients. Chronicity, it seems, is not a matter of lack of, but resistiveness to, treatment. Nor is there any doubt that patients get well without somatic treatments, now as well as in the past. But it cannot be sufficiently stressed that an unknown number of patients owe improvement or social recovery to treatment alone. The speedy interruption of acute disturbances, made possible by somatic treatments and pharmacotherapy in particular, has profoundly changed the adaptive patterns of schizophrenic patients. If and when effective, somatic therapies drastically shorten the patient's experiential exposure to psychotic ideation. The therapeutically induced modification or elimination of psychotic experiencing protects patients from surrendering to unreality which in the past, by the very fact of its prolonged existence, contributed substantially toward social deterioration.

Schizophrenic families present a therapeutic challenge. The mere fact of multiple occurrence of schizophrenia in a family may arouse unwarranted therapeutic pessimism. But is may also unleash a *furor therapeuticus*, directed at entire family units. The still prevailing reluctance to acknowledge any influence of genetic factors, reflects an irrational fear of therapeutic nihilism. That this is an irrational fear, which is neither in accordance with genetic theory nor with clinical experience, has been stressed by Kallmann and others time and again. The denial of genetic factors in the etiology of schizophrenia has, however, stimulated an immense revival of human and psychological interest in schizophrenic patients. The image of the schizophrenic as a person afflicted with somatic illness has been replaced by the image of the schizophrenic as a victim of pathogenetic parents. We are all familiar with the slogan: "You cannot treat a schizophrenic without treating the pathological environment from which he comes." What must remain questionable, is the therapeutic wisdom of collective family treatment. If therapeutic teams, i.e. psychiatrist, psychologist, social worker and counsellor, proceed as a matter of course to disentangle what are conceivably pathological family relationships, the results may prove to be more traumatic than beneficial.

There is every evidence that families with schizophrenia show individual textures of intra-familial environments as well as great divergency of prognostic potentialities. Table V illustrates the degree of prognostic variation which divides families in those with predomi-

TABLE V

FAMILIAL PROGNOSTIC PATTERNS

Unfavorable

Number Schizophrenics in Family	Hospitalized (Yrs.) Under 5	5-10	Over 10	Separated (Yrs.) Under 5	5-10	Over 10
6			XXX			
			XXX			
4	D	D	DX			
4	X	DX	X			
3			DXX			
3			DXX			
3			XXX			
3		DX	X			
3	X	X	D			
2			XX			
2			XX			
2			DX			
2			XX			
2			DX			
2			DX			
2			DD			
2			DD			
2			XX			
2			DX			
2		D	D			
2		D	X			
2		X	X			
2	D		X			
2	XX					
2		DX				
2	X	X				
5	DD	D	X			X
3			DX			X
3		X	X	X		
3	X		X		X	
3	X	X				X
3	D	D		X		

Favorable

Number Schizophrenics in Family	Hospitalized (Yrs.) Under 5	5-10	Over 10	Separated (Yrs.) Under 5	5-10	Over 10
3				X		XX
2					X	X
2					X	X
2					X	X
2				X		X
2				X		X
2				X	X	
2				X	X	
2				XX		
3			D		X	X
3			D	X		X
3			D	XX		

X—Living
D—Dead

nantly favorable and unfavorable prognoses. The degree of favorableness is measured in terms of specified time periods which have passed since the patient's last separation from the hospital. Conversely, unfavorableness is measured in terms of equal time spans of continuous hospitalization since last admission. As is evident, there are families with very favorable and very unfavorable prognoses. There are 25 families in which all individual members, and 6 families in which the majority of individual members, show an unfavorable reaction pattern. By contrast, there are 9 families in which all individual members, and 3 families in which the majority of individual members, show a favorable reaction pattern. We can now conclude that the substantial numbers of families with unfavorable prognoses account for the generally less favorable results in the family material as compared with the total schizophrenic population to which I referred. From the therapeutic point of view, then, there is this important evidence of inter-familial as well as intra-familial prognostic variation.

I am convinced that individualization of treatment should be the guiding principle. The therapeutic and prognostic potentialities of individual schizophrenic patients cannot be anticipated. Prognoses still cannot be made predictively but are retrospective statements of factual developments. No therapeutic regime, somatic or psychological, can be directed at schizophrenia. The therapeutic process depends on the conceptualization of strata of therapeutic targets, which are susceptible to selective somatic or psychological therapies. Perhaps the greatest therapeutic fallacy has been the arbitrary division into symptomatic and curative therapies. In the absence of confirmed knowledge on the etiology of schizophrenia, no therapy can take the credit of being more profound than another. If therapeutic methods effect changes in affective and social behavior by eliminating disturbances which, while far from being the "cause" or the "process" of the illness, prevent improvement, then we can gratefully acknowledge the reintegrative effects of available therapeutic measures.

Modern treatment methods have changed the clinical profile of schizophrenia. The schizophrenic of today tends to be a more sociable individual than the withdrawn and secluded patient of yesterday. Whether, in the context of this symposium on mating and fertility trends, you will consider this transformation as a therapeutic achievement or as a genetic liability, will be, I feel certain, a most dilemmatic decision.

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DISCUSSION

ERIK STRÖMGREN, M.D.*

As far as I can remember, it is the first time that I have taken part in a discussion of the fertility of mentally diseased persons. However, my inactivity in this area should not be interpreted as a lack of interest in the topic. The real explanation is that ever since Essen-Möller published his monograph on the fertility of psychotics in 1935, I have felt that very little could be added to his findings. This was, of course, not quite true. The valuable later contributions of Kallmann, Odegaard, Böök, and a few others, have clearly shown that additional useful data could be collected. But when Aubrey Lewis delivered his Galton lecture in 1958, I again thought that the whole field had been covered in an adequate way and for a long time.

One of the fascinating features of studies on the fertility of mentally disordered persons is that they open up views to many other aspects of mental illness. In addition, there is the special fact that these studies involve many factors of a *quantitative* nature, much more so than in most other areas of psychiatry. It is a field in which it is necessary to think things over in a much more accurate way than is customary in psychiatry in general. It is always advantageous from an educational point of view when the value of quantitative studies can be demonstrated in psychiatry.

Let us take the example of schizophrenia. Studies of fertility are possible here only if reliable quantitative data are available on the following facts:

1. The exact age distribution for both the given population of schizophrenics and a comparable general population; the prevalence of schizophrenia in the different age groups; and the variations in age of onset.

2. The absolute and relative values of marriage rates.

3. The problems of mate selection can be subjected to quantitative as well as qualitative studies.

4. Statistics on the marriage and celibacy rates raise questions as to (a) the sampling procedures used and (b) the factors responsible for the excess of single persons among schizophrenics. The main question is whether this excess is causally connected with the prepsychotic personality of schizophrenics, or whether marital status as such has an influence either on the risk of becoming schizophrenic or on that of being hospitalized for schizophrenia.

If both celibacy and schizophrenic psychosis are consequences of a special type of prepsychotic personality, the question arises whether this personality and the schizophrenic process have a common genetic basis.

If schizophrenia is based on a recessively inherited genotype, another important question is whether the heterozygotes have the same fertility as the general population, or a lower or higher one.

If the marital status plays a role in the development of schizophrenia, it is to be investigated whether the primary relationship is to the onset of the illness or to its progression. Perhaps, we are simply dealing here with the effect of being more or less adequately protected against the need of hospitalization.

Obviously, important questions of this kind cannot be clarified by studies of admission rates and hospital populations but require surveys of the total population.

5. It has been claimed by some investigators that the abnormal parents of schizophrenics show a quantitative predominance of the mothers. This finding has given rise to the theory of possible psychological effects of the mother's abnormality upon the child. However, such speculations should not go too far. At present, it seems that the given differences are readily explained by certain sex differences with respect to age of onset and the fertility of schizophrenics.

Beyond doubt, Dr. Freyhan's data are interesting and useful, although his method of studying affected families is sociologically oriented rather than genetic in the technical sense of the word. One of the salient questions is whether the effectiveness of modern psychiatric-treatment methods may have had some unwanted consequences in

* University of Aarhus.

that it may have increased the fertility of psychotic persons who should not have reproduced at all.

While Freyhan's data provide some qualitative impressions with respect to this question, our present knowledge regarding the quantitative aspects of the problem is still extremely limited. The main requirement for investigations of this kind is more time. No one knows at present how much earlier schizophrenic patients return to their communities nowadays than they did five or ten years ago.

In order to throw some light on this question, a rough survey was made at our hospital (Psychiatric Clinic of Aarhus University) of the first 1,000 patients treated with chlorpromazine. There were 25 patients in this series, who would not have been able to be discharged without such treatment.

Approximately one- half of these discharged patients were married and young enough to be regarded as good prospects for subsequent propagation. Estimates of this kind are not very reliable, but they raise some doubt as to the magnitude of the problem.

Leucotomy is another type of therapy that is of interest in this respect. Beyond doubt, numerous leucotomized patients who would have required continuous hospitalization without the operation have been discharged and may have had children. However, no statistical follow-up data are available on this question.

On the whole, quantitative changes in the reproduction of mentally disordered persons as the result of modern treatment methods are difficult to appraise. Fertility is a phenomenon that is influenced by many other factors. Instead of enumerating them here, may I prove my point by giving you a brief case history:

A few years ago, a schizophrenic woman, whose husband was both mentally retarded and psychopathic, was admitted to our hospital. Since she had four children of low intelligence, she was unwilling to have additional children and requested sterilization. She also wanted a divorce, because her husband had often abused her and had never been able to support a family.

Following one of his visits, the patient changed her mind with respect to both sterilizing operation and divorce procedure. The explanation offered was that according to her husband's investigations, five children was the optimal number with regard to the support available from the social agency. With one additional child, their financial situation would be somewhat improved. Therefore, they decided to get together again. Needless to say, we were rather surprised, but we had no means to counteract the effect of this part of our social legislation.

In conclusion, it may be said that investigations of the fertility of mentally disordered persons are of great importance, both clinically and theoretically. Therefore, the methods used in these studies call for careful scrutiny and wide professional interest.

GENETICS TODAY AND "THE ORIGIN OF SPECIES"

EDITOR'S NOTE:

The centennial of the publication of Charles Darwin's "The Origin of Species" has been commemorated during the past year by scholars all over the world. Two outstanding groups in the United States, the American Philosophical Society and the University of Chicago, have held meetings at which centennial papers on evolution of far-reaching import have been presented. Darwin himself lacked all knowledge of modern genetics, and his attempts to explain the mechanism of natural selection were quite unconvincing. He would have given a great deal to have had the opportunity of reading the papers written by able geneticists during the celebration of his greatest work. Developments in genetics have come so rapidly that even for those engaged wholly in the field many of these papers are a must. The following excerpts from the centennial papers of these eminent geneticists—I. Michael Lerner, Th. Dobzhansky, Hermann J. Muller—are published here in the hope that they may be useful to those who do not have time to keep fully informed but want to know the trend of genetic thinking, particularly in regard to the evolution of man.

I. THE CONCEPT OF NATURAL SELECTION[1]

I. MICHAEL LERNER

. . . every biologist agrees that selection and isolation are the basic working methods of evolution. . . . I propose to pass over the speciation or splitting level of evolution, since it involves interaction with isolation, which is to be considered here by others. . . .

[Darwin] did not see in selection a process in which deliberative judgment or choice on the part of any agency plays a part. . . . He understood that the crux of the selection process lies not merely in the ability of an individual to survive longer than others but in its greater capacity for production of living offspring. . . . The expressiveness of Spencer's superlative [fittest] seduced Darwin into accepting "survival of the fittest" as being equivalent to "natural selection." . . . Yet neither strength of character nor moral goodness, neither extreme size, nor high intelligence, nor even long life *per se* causes an individual to produce more offspring. . . . Indeed, often organisms which are totally undistinguished by any physical standards, organisms exhibiting average dimensions for various properties, in fine individuals which are mediocre for any traits obvious to the human eye, are the ones which are most successful in propagating themselves. . . .

[1]Presented at the Darwin Centennial Celebration of the American Philosophical Society, Philadelphia, April 1959. Reprinted by permission from *Proceedings of the American Philosophical Society*, Vol. 103, No. 2, April 1959.

Darwin's description of natural selection can now be paraphrased to say (1) that in nature individuals differ among themselves, (2) that their differences are in part determined by heredity, and (3) that, therefore, whenever these differences are correlated with fitness, that is, success in leaving offspring, the properties of the more fit individuals will be represented in succeeding generations to an increasing extent. Thus, changes in the make-up of successive generations are determined in a measure by the inequalities between the reproductive rates of individuals differing in hereditary endowment, that is to say, by different genotypes. . . .

It was not until Mendelian theory was developed that such pathetically artless conjectures as, for instance, the direct hereditary effects of use and disuse of organs and parts of the body, became superfluous. Three aspects of Mendelism were especially important in this connection: (1) the particulate basis of the units of inheritance to which we may refer as *genes*, (2) the distinction between phenotype and genotype, and (3) the statistical nature of the phenomena of heredity. It was also in large part Mendelian inheritance that resolved the problem of persistent variation and, more generally, led to the possibility of quantifying evolutionary processes. . . .

From the quantitative approach an understanding of the components of selection-induced alterations in fitness (those due not only to changes in gene frequencies, but also to modifications of the environment and of the mating system, as well as to gene interaction) has been gained. Methods for estimating the extent to which a population can be transformed by selection have been devised. Quantitative bases for systems of correlated response (i.e., effects on traits which themselves are not being subjected to selection pressure) characterizing changes under selection have been established. . . .

Of the several forms of pressure antagonistic to the preservation of fitness which selection must counterbalance, those of mutation and segregation are of greatest import. Elimination of deleterious mutants by selection is a process that has long been recognized. The significance of selection against non-optimal genotypes which arise in every generation as a result of segregation of chromosomes in the process of germ-cell formation, however, has been appreciated only recently. Studies from many fields . . . argue for at least as great an evolutionary importance of selection against segregation as of that against mutation. . . . Without selection against segregation genetic variability already present could be lost. William Blake's affirmation that "to be an error and to be cast out is a part of God's design" seems to be an apt description of selection against both mutation and segregation.

. . . many genotypes which rendered their possessors unfit in earlier days do so no more. Natural selection now, therefore, is not based on the same components of fitness or results in the same directional changes as before. . . . The basis of fitness has been changed, but natural selection still [goes] on. This kind of change has undoubtedly occurred many times in the past history of man, for instance, when fire-making tools were invented, thereby affording protection to some genotypes which were formerly disadvantageous.

Susceptibility to many diseases may not then contribute any more to differences in fitness of man. It is not impossible that resistance became in some instances an encumbrance. More likely, however, major importance in determining fitness was assumed by genes in control of other phenotypic traits. For instance, the genetically determined as-

pects of the ability to provide young with food obtained by strength may have now lost their positive selective value. On the other hand, genes for philoprogenitiveness in a world in which conception is under man's volitional control may have become of correspondingly greater import in the selective process.

Exactly how dysgenic in terms of human values today's natural selection may be is difficult to tell. Selection which might have the most serious potential consequences to mankind could be that operating through the medium of differential reproductive rates of groups with differing intelligence. However, there are reasons to believe that this process may be of the stabilizing kind, maintaining constant genotypic frequencies rather than shifting them in a direction commonly agreed to be an undesirable one.

Generally speaking, selection in man is probably not as stringent as it was in the past, though this is by no means certain . . . the actual reproductive rate in man is of course still greatly below its biological maximum, which means that there is still considerable opportunity for selection to occur. Evidence that inequalities in fitness currently observable are independent of genotypic constitutions would doubtless be difficult to obtain. Even so, it would seem that only when man has achieved such complete mastery over his environment that all possible human genotypes will be equally likely to produce the average number of surviving progeny, can we be sure that natural selection has ceased in our species.

II. VARIATION AND EVOLUTION[2]

THEODOSIUS DOBZHANSKY

. . . In recent years almost a surfeit of natural mutants has been discovered. True, nothing approaching exact quantitative data is available for organisms other than a few species of *Drosophila*. But only in these species have genetic tools needed for such work been devised. More indirect evidence, such as that derived from experiments on inbreeding, suggests that numerous recessive mutant genes are concealed in heterozygotes in populations of probably all sexual species, including man. This is also what one is led to expect on theoretical grounds, although, of course, the magnitude of the store of mutants may vary greatly in different species.

Modern evolutionary genetics must, then, face the problems of the structure, organization, and biological significance of the stores of mutants which natural populations are known to carry. One of the salient facts about these mutants is that most of them, like most mutants observed in laboratories, are deleterious to their carriers, at least when the mutants become homozygous. We find a great abundance of lethal, semilethal, sterile, and subvital mutants. The populations are said to carry genetic loads of deleterious variants. . . .

Hereditary diseases, defects, and weaknesses in human populations are manifestations of the genetic loads which

[2]Presented at the Darwin Centennial Celebration of the American Philosophical Society, Philadelphia, April 1959. Reprinted by permission from *Proceedings of the American Philosophical Society*, Vol. 103, No. 2, April 1959.

these populations bear in their corporate genotypes. The question unavoidably presents itself, what maintains the genetic loads in existence? Why does natural selection, which was supposed already by Darwin to perpetuate the fit and to eliminate the unfit, fail to purge the deleterious mutants from natural populations? No fully satisfactory and universally agreed upon answers to these questions can yet be returned. This is a field which requires much further research. For the time being two working hypotheses are available, referred to as the classical hypothesis and the balance hypothesis, respectively. (Dobzhansky, 1955) It may as well be stated at the outset that these hypotheses are not mutually incompatible or exclusive; on the contrary, the problem may well be reduced to finding out what proportions of the genetic loads are maintained in different living species by the mechanisms visualized by these hypotheses.

The classical hypothesis is a direct descendant of Morgan's view referred to above, but its modern guise is due chiefly to H. J. Muller (1950 and later work). Its basic postulate is that almost all mutants that arise are unconditionally deleterious . . . their effects in heterozygous condition are qualitatively similar to, although often much weaker than, in homozygotes. . . . Deleterious mutants will, then, cause slight incapacitations in many heterozygous individuals, as well as serious incapacitation or death of sporadic homozygotes. . . . Using certain assumptions, Muller has estimated that in human populations an average person is heterozygous for about seven deleterious genes. . . . The mutational load tends to grow heavier if the mutation rates increase or if the selection rates decrease. Both contingencies seem to be realized in human populations—mutations are induced owing to misuse of x-rays and atomic energies, and selection slackens because modern medicine, technology, and philanthropy save and protect from elimination many genotypes which otherwise would have failed to be perpetuated. The mutational load in the human species is, therefore, increasing and the fitness decreasing. . . . [This is the classical hypothesis.]

If the genetic load which a population carries is merely an unavoidable evil, would, then, a man, or a *Drosophila*, completely free of the genetic variants which are deleterious in homozygous condition, enjoy the greatest possible health, vigor and fitness? Would an ideally fit population be one consisting of such homozygously "normal" *Drosophilae*? We really do not know, since it is most doubtful that such populations ever existed in sexually reproducing and cross-fertilizing organisms. It may well be that the genetic loads were lighter in primitive human populations, or in those of our pre-human ancestors, than they are in modern man. But it is quite certain that the evolution of most of the living world has been enacted in sexual populations which carried genetic loads. The possibility must be considered that sexual species have become adapted to their genetic loads, and even may have used these loads to some advantage. Such a hypothesis is visualized by the balance hypothesis of population structure.

Fisher pointed out in 1930 the interesting consequences of the situation when a heterozygote for two genetic variants has an adaptive value higher than in the two corresponding homozygotes. . . . Fisher showed that natural selection will, in an outbred sexual population, establish an equilibrium condition known as balanced polymorphism. . . . We have an apparent paradox—natural selection will maintain in the population genetic variants which cause loss of fitness, disease, or even lethality in homo-

zygotes, provided only that the heterozygotes possess hybrid vigor or heterosis. . . .

Perhaps the key problem now facing the students of the genetic variability is to determine what share of the genetic loads in different forms of life can be attributed to the mutational and what to the balanced loads. This matter is important both for theory and for practice. A mutational load is kept up by recurrent mutation; a balanced load is maintained by the hybrid vigor in the heterozygotes. Stringent selection might diminish the mutational load; it would keep the balanced load at a fixed equilibrium level. Increased mutation rates, due to radiation or to other causes, would increase the mutational loads. The reaction of a balanced load expected from increased mutation is a more complex matter; at least under some conditions the balanced load would be affected only slightly.

In man there is at present but a single convincingly established case of balanced polymorphism, namely that of the sickle-cell gene in African populations. . . . However, I think that it is fair to say that there is presumptive evidence for several more balanced polymorphisms in man; doubtless there will be much activity in this field of study in the near future.

Lerner, who must be credited more than anyone else with the authorship of the balance hypothesis of the population structure (1954, 1958), has summarized a large amount of evidence from his own experiments, and from those of other workers, dealing with selection for improved performance in breeds of domestic animals, particularly in poultry. What this evidence shows is essentially that top performance is very often found in heterozygotes. Attempts to fix this peak performance by rigid selection are unavailing, since when the selection is relaxed a relapse to a lower level of performance is observed. This resistance to continued gains with selection, and the loss of the gains already achieved upon relaxation of selection, Lerner has called the genetic homeostasis. A trait selected may show a high degree of heritability as estimated by usual methods, and yet no progress may be achieved by selection. The task of the breeder is, then, more intricate than the classical hypothesis has led us to believe. It is not isolation of some one genotype which engenders superior qualities in its carriers. It is rather construction of a new balanced gene pool of the population, such that the processes of Mendelian segregation and recombination would usually yield highly productive genotypes and phenotypes. The adaptive norm existing in a highly fit natural population, and that desired in a population under artificial selection, are aggregates of many genotypes in which the constituent alleles interact in a favorable manner. . . .

The conclusion seems warranted that, in species with a genetic structure like *Drosophilae* which we have studied, the genetic variability in natural populations is kept up mainly by the recombination of the genetic variants stored in the gene pool. These variants have arisen ultimately by mutation. Nevertheless, so great is their accumulated store that a suppression of the mutation process, if it were attainable, would not appreciably diminish the genetic variability available for evolutionary adaptations, and this probably for many generations.

It is not due to academic scruples alone that the above conclusion is explicitly limited to the species actually studied. For one of the tenets of modern evolutionary thought is that there are many evolutionary patterns rather than a single universal one. . . .

III. GUIDANCE OF HUMAN EVOLUTION[3]

HERMANN J. MULLER

. . . If . . . we define fitness in the narrow (but erroneous) sense by the criterion of leaving a larger number of immediate offspring, then, of course, later generations of men must by definition, be increasingly fit. Yet this type of fitness is no longer the same as fitness in regard to the qualities conducive to the well-being and survival of mankind in general. In fact, it seems not unlikely that in regard to the human faculties of the highest group importance—such as those needed for integrated understanding, foresight, scrupulousness, humility, regard for others, and self-sacrifice—cultural conditions today may be conducive to an actually lower rate of reproduction on the part of their possessors than of those with the opposite attributes. . . .

From these considerations arise the possibility that a much faster-acting and more serious cause of genetic deterioration than the previously discussed accumulation of detrimental mutations occurring in the wake of relaxed selection is an actual reversal of selection in regard to those psychological traits that are of the highest social importance. Objective data are badly needed on this question . . . potential consequences for the biological evolution of man have not been considered seriously enough, even though Darwin himself called attention to them. . . . Unless we are willing to remain, when viewed in larger perspective, helpless creatures of circumstances, we must take these insidious operations into account, master their principles, and devise ways of dealing with them.

. . . many warning voices—even among geneticists, or perhaps among them more especially—will be raised protesting that we cannot predict the results of any matings in such heterogeneous material as an existing human population. We have, for such purposes, the merest smattering of knowledge regarding the genes concerned; and what the more important ones—those concerned with the traits we are here most interested in—will do in new combinations is anyone's guess. We could not proceed according to the principles governing simple Mendelian differences, and we should be practising not genetics but a dangerous hoax.

This argument sets up straw men and then knocks them down with straw swords. The multifactorial basis of most phenotypic differences in human and other natural, cross-breeding populations is undisputed—especially in regard to differences in traits of importance and therefore long subject to natural selection—although, of course, some gene differences produce major effects, along with many more that produce minor ones.

. . . selection carried out on a purely empirical basis does work. . . . Even primitive man was intelligent enough to do much better than nature usually did, inasmuch as he effected changes in his domestic races, in the directions sought, at a pace much faster than that at which species ordinarily change when under natural conditions of breeding. This was because his manner of selecting was less haphazard and more single-tracked than nature's. The selection

[3]Presented at the Darwin Centennial Celebration at the University of Chicago, November 1959. Reprinted by permission from *Perspectives in Biology and Medicine*, Autumn 1959.

practiced by modern man, especially in the present century, has been much more rapid and effective still, even though it likewise has in the main had to proceed without analysis of the individual genes concerned. Where the inherited differences are multifactorial, as they usually are in the case of traits of importance in any organism, gene identification is seldom feasible. . . .

Since the hereditary mechanism is known to be the same in man as in sexually reproducing organisms in general, there is no reason to doubt, on purely genetic grounds, the potential efficacy of an empirical type of selection for man also—consistent with general genetic considerations but not, at least in the early stages, based on knowledge of the particular genes concerned. . . .

Although the mores of our society approve the extension of society's aid to individuals for the purpose of saving lives and thereby enabling them to reproduce, they do not yet, reciprocally, recognize a duty on the part of individuals to exercise their reproductive functions with due regard to the benefit or injury thereby done society. So long as illegitimacy is avoided, the individual is not considered to be under any genetic obligation but deems it his right to have as many or as few children as he personally wishes. This being the case, his choice in the matter is largely determined by irrational factors and by shortsighted aims. Such practices worked out well enough genetically only so long as, in matters of survival, the families or the small groups were in large measure on their own.

What is most needed in this area of living is an extension of the feeling of social responsibility to the field of reproduction: an increasing recognition that the chief objective in bringing children into the world is not the glorification of the parents or ancestors by the mere act of having children, but the well-being of the children themselves and, through them, of subsequent generations in general. When people come to realize that in some measure their gifts as well as their failings and difficulties—physical, intellectual, and temperamental—have genetic bases and that social approval or disapproval will be accorded them if they take these matters into account in deciding how much of a family to beget, a big step forward will have been taken in the motivation of human reproduction.

It can become an accepted and valued practice to seek advice, though not dictation, in these matters, even as it is today in matters of individual health. Although no one enjoys admitting his faults, he can learn to take pride in exercising humility and ordering the most important of his biological functions—reproduction—in such ways as to win the approbation of himself and his fellows. This is, to be sure, a higher type of mutual aid, a superior moral code, than exists at present, but it can be just around the corner for people who have been alerted from early youth to the fact of genetics and evolution and who have been imbued with a strong sense of their participation in the attainment of human well-being. . . .

That is not to say, of course, that there can be hard and fast rules and that any one or a few known genetic defects should enjoin a person from reproduction. Everyone has many minor and some more serious inherent imperfections. In conscious decisions, as in the process of primitive natural selection, it is the total balance of these that should count, and the answer need seldom be an all-or-none one.

Contrariwise, for those clearly better endowed, this kind of social motivation should lead them to place special importance on creating children, even though in such cases especially there will be much temptation to expend dis-

proportionately much effort in other directions. It is true that economic and other aids could be of value here. However, the underlying mores will inevitably exert the more powerful influence. The main job, if the situation is to be rectified, consists in laying the foundations for these mores.

This does not mean that we can expect ever to specify just what would be the optimal number of children for any given individual to have, in view of his genetic constitution. Natural selection would never have succeeded in the past if such precision were necessary. Environmental influences always complicate, sometimes inextricably, the determination of developed traits. It is enough, from a long-range point of view, if only the trend is in a salutary direction. And that is the result that must be sought in the attempt to protect man's most invaluable possession—his own genetic material.

Two developments of our present period are powerful positive influences toward the needed change in motivation. One is the sudden realization of the damaging effects of radiation on heredity. This, by reason of having been made a political football, has done more to arouse the public and all its leaders to the fact that our genetic constitution requires protection than all the propaganda that eugenicists have ever put forth. Characteristically, the danger has been greatly exaggerated in some quarters, . . . and has been just as unjustifiably dismissed or played down in other quarters. . . . Nevertheless, the over-all effect of the controversy has been highly educational and has helped to make people far more genetics-conscious than they ever were before. It so happens that this same radiation problem is one of the proper faces of the ax which is here being ground. Thus it is fitting to take advantage of the receptivity created by political circumstances to awaken the public to the more general need for a reformation of our attitude toward reproduction.

The other relevant development of our time is the menace of overpopulation. Even publicists are at last becoming alarmed at the smothering of cultural advance and the disaster to democratic institutions that it can bring about in a generation or two if unchecked. To check it absolutely requires not only that birth-control techniques be made available but also that large masses of people execute an about-face in their attitude toward having children. They must recognize that to have or not to have children, and how many, should be determined primarily by the interests of the children themselves—that is, of the next and subsequent generations. If this change in outlook is effected—as it must be sooner or later—it is a relatively short step to the realization that the inborn equipment of the children also counts mightily in their well-being and opportunity for happiness. . . .

[There are] . . . vast individual differences in native intellectual capacity, temperament, and emotional pattern . . . among human beings, even as among higher animals. Studies of twins and people brought up in institutions and foster homes have shown clearly the high, though far from absolute, importance of their heredity in the determination of psychological as well as so-called physical traits. Undoubtedly, even seemingly minute features of the personality can be strongly influenced by the genes. More important, there are abundant instances of extremely high mental ability, of a generalized kind, reappearing conspicuously in some members of families while missing other members. Certainly, there is already genetic material on hand, recognizable through its expressions, which, if conferred on the population at large, could

enable men in general to find freedom and release by engaging in great cooperative as well as individual assaults against the seeming inexorabilities of the outer world and their own stubborn natures and by giving the feelings thus engendered creative and artistic expressions. . . .

No people, no caste, or class, has a monopoly on these essentials. But there is everywhere a dearth of them, in relation to present needs. Let men become more conscious of this dearth and, conversely, of the richer life that later generations may have in proportion to the degree to which that dearth is remedied. . . .

The main values to be striven for genetically are the same as those generally recognized already as the chief aims in the bringing up and education of individual children: namely, on the physical side, more robust health; on the intellectual side, keener, deeper and more creative intelligence; on the moral side, genuine warmth of fellow feeling and cooperative disposition; on the apperceptive side, richer appreciation and its more adequate expression. A conscience that is socially oriented in regard to reproduction will lead many of the persons who are loaded with more than the average share of defects in the genetic bases of these faculties to refrain voluntarily from engaging in reproduction to the average extent, while vice versa it will be considered a social service for those more fortunately endowed to reproduce to more than to the average extent.

This trend will be greatly promoted as techniques and facilities are improved and accepted that allow the transfer of germ cells or potential germ cells, their accumulation and maintenance in frozen or multiplying condition, and their rational testing, selection and manipulation. Thus children can be adopted not merely after birth but even (as it were) before fertilization. These children may come to attain the status and enjoy the affection and other advantages of those naturally conceived.

By these means the way can be opened up for unlimited progress in the genetic constitution of man, to match and reenforce his cultural progress and, reciprocally, to be re-enforced by it, in a perhaps never-ending succession.

THE ACQUISITION OF INHERITED CHARACTERS BY EVOLUTION

JAMES C. KING
Columbia University

Two recent books dealing with scientific epistomology, *Personal Knowledge* by Michael Polanyi and *Patterns of Discovery* by N. R. Hanson, establish very strikingly the importance of the subjective set of the investigator in the interpretation and synthesis of scientific data. All human beings as amateurs, scientists and philosophers as professionals, have an irresistible urge to tidy up what they know in a comprehensive system of explanatory beliefs. Such a system gives the individual aesthetic and spiritual satisfaction. People differ in the degree of comprehensiveness and internal consistency which they demand of their systems, but every man's system is influenced by the attitudes and axioms which he has come to accept in the course of arriving at the age of reason. So strong are these personal *Gestalts* that even trained scientists when they sense the same phenomena often perceive quite different things. The simple nineteenth-century faith in the possibility of achieving absolute objectivity seems to have taken off with a velocity rapidly approaching 186,000 miles per second.

Three current books[1] on evolution illustrate beautifully how three contemporary geneticists, setting out to communicate to the public something of the nature and meaning of their specialty, come out with three utterly different messages. From Sheppard we get an admirably lucid, closely reasoned summary of the essentials of genetic theory and clear analyses of many of the processes through which organisms and their environment interact to produce evolutionary change. Dunn also gives a clear and succinct summary of genetic principles – somewhat less comprehensive than Sheppard's but probably more digestible for the undedicated layman. Approaching the subject of genetics and evolution as it applies to human populations, he treats us to a mature essay pervaded by the assurance which comes from great knowledge and also from the fearless recognition of the enormity of our ignorance. Zirkle sees in the present state of the science of genetics a conspiracy to subvert it, and he produces a political tract.

To deal first with the conspiracy charge. Zirkle is convinced that the educated public is kept insulated from sound knowledge of genetics because of powerful influences in literature and social science which are consciously antigenetic. These influences stem from Marxism which has insinuated its own brand of false biology into the thinking of our social scientists and *literati*. The power of these false doctrines is so great that we are denied the benefits which would accrue to us through the application of true, objective genetic principles.

Zirkle accurately points out that Marx

[1] L. C. Dunn, *Heredity and Evolution in Human Populations*, Harvard University Press (1959); P. M. Sheppard, *Natural Selection and Heredity*, Philosophical Library (1958); and Conway Zirkle, *Evolution, Marxian Biology, and the Social Scene*, University of Pennsylvania Press (1959).

and Engels avidly accepted Darwin's theory of evolution because it fitted admirably into their concept of materialism, that they completely reject Malthus, however, and that they held firmly to the doctrine of the inheritance of acquired characters. He goes on to show that Marxian theology, as it has developed in Russia, has retained these tenets and has supplemented them with a rejection of Weismann, of Mendel and of any program of eugenics.

Beyond this point Zirkle sees patterns which constitute the conspiracy. Anyone who criticizes Malthus, Weismann or Mendel, who can contemplate the inheritance of acquired characters or who is not an ardent eugenicist as Zirkle understands the term is a Marxist, overt or covert. The key attitude most accurately diagnostic of this heresy is a lack of enthusiasm for eugenics. The roster of heretics is long and astonishing. It includes, among others, Alfred Lord Tennyson, Alphonse Daudet, George Bernard Shaw, Jack London, Lester Frank Ward, William F. Ogburn, L. C. Dunn, Th. Dobzhansky and Bentley Glass.

It is regrettable that anyone so well grounded in the history of biology and of genetics should have allowed himself such an emotional field day in print. What Zirkle entirely ignores is that intellectual systems, like evolution, are opportunistic constructions, made of what is conveniently at hand. Man's brain is not merely a memory computer; it is emotionally weighted. Criticism of theories of population pressure, of the struggle for existence, of the unchanging germ plasm are quite understandable as reactions against the arrogance and distortion with which these doctrines have been preached by some of their supporters. Such reactions are not evidence of a communist conspiracy. But what is more, it is a frightening prospect if criticism or skepticism of some scientific belief is to be taken as evidence of political heterodoxy. What will happen to science and to freedom of thought if accepted beliefs are to be elevated above criticism?

It is part of the catechism of science that all hypotheses and systems are fair targets for experimental or speculative attack. Yet a theory once accepted often picks up a momentum which allows it to coast on in spite of well-founded and persistent criticism. Genetics illustrates this tendency in its apotheosis of the single gene as the basis of anatomical, physiological and behavioral adaptation. In all three of these works this basic motif keeps bobbing up.

In pre-Darwinian days probably the greatest obstacle to the formulation of a theory of organic evolution was the prevailing doctrine of catastrophism or progressionism. Great upheavals had occurred from time to time in the earth's history, producing mountains, gorges and other dramatic features of the landscape and eliminating at the times of these disasters whole faunas which were then replaced by new casts of animals. With such a picture firmly in one's mind, why waste effort constructing a theory of gradual change in animals and plants? It was not until geology had become anti-catastrophic and uniformitarian, emphasizing the slowness and constancy of the cycle of erosion, that a theory of organic evolution could be fitted in.

Once formulated the doctrine of evolution needed a theory of inheritance to explain response to selection. No such theory was available, and for forty years the evolutionists floundered. When a theory of heredity did appear with the

discovery of Mendel in 1900, it by no means satisfied the evolutionist. It was particulate and explained why variation did not disappear through blending, but its emphasis on pairs of alternate alleles producing contrasting forms in fixed ratios was a new sort of catastrophism. One seemed to be back in pre-Lyellean geology. The evolutionist was not looking for an agent that produced strikingly different forms in a single step. He wanted something that would explain changes occurring gradually by the repeated addition of small increments.

Thirty years after the discovery of Mendel the work of Fisher, Haldane and Wright began a synthesis of genetics and evolution. Developments since 1930, multifactorial and polygenic systems for explaining continuous variation, the development of the concept of the population and recent evidences that the gene pool is an integrated whole rather than a fortuitous collection of atomistic genes have made genetics – potentially at least—as gradualistic and uniformitarian as the cycle of erosion. All three of these authors are, of course, aware of these developments and all specifically refer to them. But in the excitement of controversy or in concentrating on an involved explanation, the geneticist still displays a weakness for the old 3:1 war paint.

In discussing a program for eliminating feeblemindedness, Zirkle falls back on a single gene "to avoid the complications of modifying genes." Dunn very aptly points out that differences in visible human characters must result from many genes of small effect; he cites evidence of an adaptive interaction between the ABO and the Rh blood group systems and he suggests "that selection in the long run acts on complexes of genes, on whole genotypes rather than on the effects of single alleles." But these very exciting observations are made almost incidentally and are never exploited or driven home. The emphasis remains on the analysis of the frequencies of alleles at single loci—the ABO locus, the Rh locus, that for sickle-cell anemia.

Because he deals primarily with natural selection, Sheppard makes one particularly aware of the great inertia of the theory of the single particulate gene. One keeps being asked to picture selection choosing between this and that allele at some single locus. Polymorphism is the presence of two—or at most a small number—of contrasting types controlled by major switch genes; it is catastrophic, not part of a smoothly continuous distribution. There is a chapter entitled "Polygenic Inheritance and Selection' but even here the polygenic system appears as just a more complicated substitute for a single gene. The concept of an integrated genetic system is simply not to be found in the discussion. This is most obvious in the section labeled "The Founder Principle" dealing with Mayr's famous paper, "Change of Genetic Environment and Evolution." The main point of Mayr's argument is lost in Sheppard's summary.

Natural selection is, of course, no independent force. It is merely a name for the reactions continuously going on between living things and their environment. These reactions are extremely complex. They can be studied only by analytical simplification – extracting a part of the process and describing or measuring it in isolation. But the process itself remains unbelievably complex and must be resynthesized to be visualized or appreciated; it is not just the

sum of even a large number of isolated computations. Its parts fit together dynamically. In a very real sense it is alive; it is a phase of life. If one were to personify it, it would be a sprightly, mischievous Artemis of such competence and versatility that she played her role with absent-minded virtuosity. Sheppard's analysis suggests instead a bovine Hera who accomplishes her task by application, concentration and resignation. One feels that one has been given the cold numbers but no glimpse of the divine vision.

Few students of intellectual history would quarrel with the statement that the three most influential thinkers of the nineteenth century were Darwin, Marx and Freud. The Lysenko controversy has made all geneticists professionally aware of Marx even though it may not have engendered in all of them a deep appreciation of his position and influence. Freud, however, is either ignored or actively rejected by the great majority of geneticists. It is interesting that in these three volumes there is only one reference to Freud and that merely an incidental one in a quotation cited by Zirkle. Nowhere is there any reference to his work or contributions. The same is true of *Darwin's Century* by Loren Eiseley.

The importance of Freud does not lie in the details of his psychological theories nor in the neat and rigid theological systems which have been constructed by some of his disciples. His importance lies in his having emphasized the role of the irrational and the unconscious in human behavior and the way in which the individual personality is synthesized by a progressive integration of irrational and unconscious elements during development.

These ideas have been widely assimilated in many fields—medicine, particularly psychotherapy, psychology, the social sciences, the arts. They are as generally influential in the intellectual life of today as is the doctrine of organic evolution. But genetics gets along without them.

Except for the mention of blood groups, Sheppard avoids all questions of human evolution. Zirkle's quarrel with Marxian biology is that it is depriving us of the benefits of a positive eugenics program which would raise the level of human intelligence. He does not define intelligence. He seems to equate it with the I.Q., but he also relates it to the total technical competence of a society. Civilizations fall when they lose too many of their genes for intelligence. This assumption that intelligence is a single definable entity, measurable on a linear continuum, under very simple genetic control and a guarantee of everything desirable in human behavior indicates a complete innocence of current developments in psychology. But this deduction is unnecessary; there is an explicit footnote on page 270.

Dunn takes no such position. He refers not to intelligence but to wits, brightness, mental ability, intellectual performance. He doubts that Galton was justified in assuming that success by itself was proof of gene-determined ability. He points out that other characters such as emotional stability are quite as important as brilliance. Dunn's position is that we just don't know—a truly admirable one for it accurately fits the factual situation. But for the student of human evolution the problem of understanding the relation between human behavior and genotype is still there. In order to deal with it, one must know something of psychic ontogeny just as one must know something of embryol-

ogy in order to understand the evolution of anatomy. It has taken a hundred years to get Darwin and Mendel together; it is obviously going to take a few more decades to work Freud into the partnership.

Some day someone will synthesize all these fragments—the integrated genetic system, the population, physical development, biochemistry, psychic development, culture and natural selection in one grand concept which will reverberate through human minds with a crescendo like that which accompanies a tropical dawn. In Dunn's book one senses a tentative approach in this direction, but what we get is a faint suggestion of the rosy fingers as one might see them on a November morning in New England. Maybe it just isn't time yet for sunrise.

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SOME PROBLEMS IN PREDICTING A COUPLE'S CONTRACEPTIVE FUTURE

ROBERT G. POTTER, JR.
Office of Population Research
Princeton University

AS WAS STRESSED AT A RECENT CONFERENCE sponsored by the Planned Parenthood Federation of America (P.P.F.A., 1959), workers in a birth control clinic are repeatedly asked by patients: "How sure can I be that this method of contraception will protect me from another pregnancy?" Is this question answerable? More particularly, does information about the patient's contraceptive past permit precise inferences about her contraceptive future? If the patient is considering method X and if other patients using this method have experienced a specified number of pregnancies per 100 years of exposure, is it possible to derive from this group failure rate a specific prognosis for the individual patient?

This paper will argue that these questions must usually be answered in the negative. Ordinarily it is not feasible to predict a patient's chances of avoiding another pregnancy, at least with any useful degree of precision. However something can be said to the patient about factors increasing or decreasing her chances of full protection. Accordingly a second objective of this paper is to construct a highly simplified model relating risk of another pregnancy to (1) regularity of contraceptive practice and (2) numbers of years during which protection is sought.

LIKELIHOOD OF ENTIRELY SUCCESSFUL CONTRACEPTION

A given patient hopes to use contraception to space her births and then, after attaining desired family size, to prevent any further pregnancies. Her chances of doing so may be viewed, in a highly idealized manner, as a function of two main factors: (a) her monthly risk of pregnancy during practice of contraception; and (b) the length of her "risk period," including in the latter both the desired postponements of wanted pregnancies and the interval between attaining desired family size and onset of permanent sterility.

Her monthly risk of pregnancy with contraception may be interpreted as the product of two probabilities, namely, her fecundability—monthly likelihood of pregnancy when no efforts are made to prevent conception—and her contraceptive efficiency. By the latter is meant the extent to which practice of contraception reduces her fecundability toward zero. Strictly speaking, both fecundability and contraceptive efficiency vary from month to month, as well as tending upward or downward in the long run; but as first approximations they will be taken as constants.

Given the assumption that the monthly risk of pregnancy during contraception is constant, the patient's chances of

being entirely successful with contraception may be estimated by the formula

$$(1-p)^t = q^t,$$

where p is the constant monthly risk of contraceptive failure and t is the length of the risk period in months.

But ordinarily one does not have an estimate for either p or t. One cannot estimate the length of the risk period without first predicting age at onset of permanent sterility. It is well documented that mothers' ages at last confinement vary greatly in societies believed to be practicing little or no contraception (Tietze, 1957). To circumvent this problem, one might stipulate a range of risk period length, perhaps predicating the lower bound on sterility at age 35 and predicating the upper bound on sterility at age 34. Thus a woman marrying in her early twenties faces a risk period varying from more than 10 to more than 20 years.

Even more difficult to estimate is the patient's monthly risk of pregnancy during contraception. Perhaps the patient has not used contraception earlier, and one has only information about how long she has taken to conceive in the absence of birth control. This information tells something about her fecundability but nothing about her potential efficiency with contraception. If she has practiced contraception earlier, often it has been with another method than is now being recommended. The assumption that she will be at least as efficient with the new method as with the old is risky because, as many clinics have found, the use-effectiveness of a method depends as much upon the patient's reaction to the method as upon its intrinsic effectiveness.

The best situation for estimating, then, is when the patient has already accumulated experience with the method being recommended. In this case it is more reasonable to assume that her future contraceptive efficiency will be at least as great as her past efficiency. Unfortunately this past experience usually does not extend more than 2 or 3 years and rarely longer than 5 years. Yet even 5 years is not enough experience to permit an usefully precise inference. This is worth illustrating, and in the examples below it is assumed that the patient's monthly chances of avoiding pregnancy with contraception are constant from month to month.

Suppose that a particular patient has successfully used contraception 2 years before her first pregnancy and three years before her second. Altogether this makes 5 years of contraception without a failure. Quite possibly the patient is enjoying a high level of protection and deserves assurance about her future; but there is also an appreciable likelihood that her protection is quite mediocre and that so far she has merely been lucky. Adopting R. A. Fisher's principle of maximum likelihood, one may ask what monthly chance of avoiding pregnancy yields the observed record with highest probability. That is, what value of q maximizes the expression q^{60}? The answer, a q-value of one, is scarcely satisfactory unless one is willing to admit the possibility of perfect contraceptive efficiency. It does indicate that a high degree of protection has greater likelihood than a low degree of protection. Nevertheless the latter inference cannot be dismissed. By setting q^{60} equal to .05, one finds that 5 per cent of the time a couple can escape pregnancy for five years with a monthly chance of avoiding pregnancy as low as .95. Such a low q-value represents an expectation of several pregnancies during a ten-year risk period. Considering a less extreme possibility, one-third of the time a .98 monthly chance of avoiding pregnancy might generate the record observed; yet

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it carries an expectation of approximately two pregnancies per ten-year risk period. Thus from a record of no failures in five years of contraception one can infer rather little.

As a second example, suppose that the patient has experienced one pregnancy during 60 months of contraception. Here a monthly chance of avoiding pregnancy of .983 has the greatest likelihood, that is, constitutes the q-value which maximizes the expression pq^{59}.[1] However, a wide range of q-values have likelihoods nearly as large. Thus, monthly probabilities of avoiding pregnancy of .950 and .997 both have likelihoods more than one-third as high as the maximum likelihood value of .983. Yet the first of these values promises several pregnancies during a twenty-year risk period, while the other assures a 50-50 chance of escaping pregnancy altogether during the same period.

EXTRAPOLATING FROM GROUP EXPERIENCE

Let us suppose that the clinic has accumulated enough experience with the method being recommended so that a fairly stable failure rate based on a sizable sample can be computed. Now x pregnancies per 100 years of contraceptive exposure implies a little under $x/10$ pregnancies per ten-year risk period, or a little under $x/5$ pregnancies per twenty-year risk period. For instance, if the clinic patients using the recommended method have experienced 15 pregnancies per 100 years of contraceptive exposure, this implies an expectation of somewhat under 1.5 pregnancies during a ten-year risk period or somewhat under 3.0 pregnancies during a twenty-year risk period. How relevant are these statistics for predicting a single patient's future?

Obviously these expectations of almost 1.5 and 3.0 pregnancies will be too high if the patient is fated for an early onset of permanent sterility. Extrapolating from group experience also has the disadvantage that it tends to lead to an unduly pessimistic or optimistic prognosis depending on whether the patient and her husband are above or below average in their contraceptive efficiency. Moreover, errors of pessimism are likely to outnumber mistakes of optimism. When the durations of contraceptive exposure of a group are arranged into a frequency distribution, they reveal great skewness, suggesting that a minority of the sample are well above the group's average with respect to monthly risk of unplanned pregnancy, while the majority are below it. But quite aside from this issue of accuracy of prediction, one may wonder how much encouragement a patient draws upon hearing that she has an expectation of somewhat under 1.5 to 3.0 pregnancies during the remainder of her reproductive period.

The fact that a patient's prospects with a particular method are not precisely calculable does not mean that the patient will ask for a prediction any less often. Some kind of answer must be given, and of course a statistically sound answer is not necessarily the most politic one. Nevertheless it seems worthwhile to try to outline some of the elements of a statistically sound reply.

ELEMENTS OF A REPLY

Only sterility or perfect contraceptive efficiency assures complete protection against unwanted pregnancy. Since perfectly efficient use of contraception does not exist, any fecund patient faces at least a small risk of eventual pregnancy

[1] Given a record of one pregnancy in t months of contraceptive exposure, the maximum likelihood estimate of p, the monthly probability of pregnancy despite contraception, is $1/t$, derived by setting the first derivative of $p(1\text{-}p)^{t-1}$ equal to zero and solving for p. The complement of $1/t$ furnishes the maximum likelihood estimate of q.

regardless of the method she is using. Other things equal, the risk of eventual pregnancy is greater when the risk period is longer and, for a constant risk period, is greater or less according to the patient's monthly chance of contraceptive failure. The patient exercises considerable control over the latter factor through the regularity with which she practices contraception. This last fact may be dramatized if long enough histories with the recommended method are available. Then it becomes possible to cite that amongst a sample of apparently fecund users, some have gone many years without an unintentional pregnancy while others have experienced multiple pregnancies in the same period.

Estimates of mean fecundability typically range from .2 to .4.[2] Accordingly when the risk period is as long as ten years, very efficient contraception must be practiced in order to insure even a 50 per cent chance of escaping further pregnancy; and of course even more efficient contraception is required for a 95 per cent chance of complete protection. Indeed in this last case, virtually no chance-taking in the form of omitting contraception near the middle of the menstrual cycle can be afforded. The remainder of this paper is devoted to documenting these last statements.

PROTECTION DURING LONG RISK PERIODS

To determine the monthly probability of avoiding pregnancy which is necessary to yield a 50 per cent chance of complete protection during a risk period of t years, set q^t equal to .5 and solve for q. Subtracting this answer from one gives the associated monthly risk of contraceptive failure. Finally, this monthly probability of failure is multiplied by 1200 in order to convert it into the form which has become conventional in the literature, namely, number of failures per 100 years of contraception. The requirements for a 95 per cent chance of complete protection are derived in the same manner, except that .95 is substituted for .50 in the first equation.

In Table 1, results are given for risk periods of 1, 5, 10, and 20 years. Because of a major simplifying assumption, namely, that the monthly risk of unplanned pregnancy is constant, these results indicate only orders of magnitude. Nevertheless, it is interesting that the failure rates estimated as necessary for a .95 chance of complete protection during risk periods of 5, 10, and 20 years are below the lowest rates recorded in the literature.

OMISSIONS OF CONTRACEPTION

It remains to consider what frequencies of contraceptive omission are consistent with a .50 or .95 chance of complete protection during risk periods of specified length. Enough simplifying assumptions are made so that the results, tabulated in Table 2, are only suggestive.

The length of time during a menstrual cycle when coitus has an appreciable chance of initiating pregnancy, hereafter termed the "fertile period," is brief. It is assumed that every month includes a 24-hour fertile period and that coitus coinciding with this fertile period always produces pregnancy. During the week centered on the fertile period, coitus is practiced with a specified frequency, spaced at least 24 hours apart. Fecundability stands in direct proportion to coital frequency: a frequency of c times

[2]These estimates come from two sources: (a) among successful contraceptors eventually becoming pregnant, the proportion who report doing so in the first month after deliberately stopping contraception for that purpose; and (b) among newly-weds not using contraception and eventually getting pregnant, the proportion who report getting pregnant the first month of marriage.

TABLE 1
CONTRACEPTIVE FAILURE RATES YIELDING .50 AND .95 CHANCES OF COMPLETE PROTECTION DURING RISK PERIODS OF SPECIFIED LENGTH

Length of risk period (years)	Pregnancies per 100 years of contraception	
	.50 chance of complete protection	.95 chance of complete protection
1	67.3	5.2
5	13.8	1.0
10	7.0	0.5
20	3.5	0.2

TABLE 2
RATES OF CONTRACEPTIVE OMISSION CONSISTENT WITH .50 AND .95 ASSURANCES OF NO PREGNANCY DURING RISK PERIODS OF SPECIFIED LENGTH, FOR STIPULATED COITAL FREQUENCIES

Length of risk period (years)	.50 assurance of complete protection, given coital frequencies of:			.95 assurance of complete protection, given coital frequencies of:		
	1x/wk	2x/wk	4x/wk	1x/wk	2x/wk	4x/wk
1	.3926	.1963	.0981	.0301	.0150	.0075
5	.0805	.0402	.0201	.0063	.0031	.0015
10	.0406	.0203	.0101	.0028	.0014	.0007
20	.0203	.0101	.0050	.0014	.0007	.0004

per week implying a fecundability of $c/7$.[3]

It is further assumed that contraception is perfectly efficient when used but is omitted with a stipulated frequency during the week centered on the fertile period. When contraception is used, there is zero chance of pregnancy. But when contraception is omitted during a coitus coinciding with the fertile period, pregnancy is certain.

Given these assumptions, simple calculations lead to the results tabulated in Table 2. To illustrate, consider the frequency of chance-taking permissible for a .5 assurance of no pregnancy during a risk period of ten years, given a coital frequency of twice a week. According to earlier calculations made in connection with Table 1, a monthly pregnancy chance of .0058 can be tolerated. Without any contraception (100 per cent chance-taking) the monthly chance of pregnancy is 2/7 or .2857. The rate of chance-taking which will reduce this fecundability to the critical .0058 level is .0058/.2857, or .013. Thus, omissions of contraception around the middle of the menstrual cycle must be confined to something like 13 in 1000 times.

Table 2 indicates that, when risk periods are as long as 10 years, very little chance-taking can be afforded. Even with a coital frequency of once a week, omission of contraception must be kept under 5 times in a hundred in order to secure a .50 chance of complete protection; and to reach .95 insurance against eventual pregnancy, the omissions must be kept under 5 times in a thousand. Resting on so many simplifying assump-

[3]Given the other assumptions being made, a fertile period of 24 hours leads to levels of fecundability approximating those empirically observed. According to the statistics of Kinsey *et al.*, modal coital frequencies for Americans in early marriage are 2 and 3 times a week. (Kinsey *et al.*, 1953) These frequencies imply fecundabilities of 2/7 and 3/7 respectively, or .28 and .43 which fit fairly well with observed mean fecundabilities ranging from .2 to .4.

In reality, of course, the length of the fertile period is variable and during many months must average substantially longer than 24 hours in order to compensate for the pregnancies aborting too early to be recognized, and for the months when there is no fertile period because the menstrual cycle is anovulatory or the released ovum defective and unfertilizable.

tions, these estimates are subject to large errors. But it is more likely that they exaggerate the limits of permissible chance-taking than underestimate them because of the assumption that contraception is perfectly effective when used.

SUMMARY

Usually there is no way to answer exactly the contraceptive patient who asks: "How sure can I be that this method will protect me from another pregnancy?" Chances of complete protection during the remainder of her reproductive period depend on (1) the length of that period and (2) her typical monthly risk of unplanned pregnancy during that period. Ordinarily neither of these statistics can be estimated with any precision from the patient's previous record.

It is even hard to find an answer that is both optimistic and honest. If the patient has borne all her desired children by her late twenties, then her period of pregnancy risk may last 10 or 15 years more. To be nearly certain of protection during such a long risk period presupposes a monthly risk of contraceptive failure lower than any of the risks implied by published failure rates. For example, a rate of 3 pregnancies per 100 years of exposure furnishes only a .74 chance of complete protection during a ten-year period, well short of the .95 assurance or better that the patient would like. Thus group failure rates cannot be cited in encouragement unless one can assume that the patient in question will prove unusually proficient in her use of the recommended method; but her past record seldom is extensive and relevant enough to demonstrate this decisively.

In this predicament, one hopes to be able to state that the recommended method compares favorably with other methods in group use, or even better, that some couples have remained protected by it for long periods. In any case, one stresses that the protection received from the recommended method, like that from any other method, depends greatly on the regularity with which it is used. Virtually no chance-taking during the middle of the menstrual cycle can be afforded if a high assurance of complete protection is desired.

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HELEN G. HAMMONS, Business Manager.

Sworn to and subscribed before me this 31st day of October, 1959

[SEAL] ETHEL J. MCFADDEN

(My commission expires May 1, 1961)

Book Reviews

WHO: SIXTY YEARS OF AMERICAN EMINENCE. The Story of Who's Who in America: Cedric A. Larson. McDowell, Obolensky, New York, 1958, 389 pp.

In 1936 H. L. Mencken wrote: "All literate Americans know that admission to *Who's Who in America* costs the chosen nothing . . . and cannot be bought by the heathen with gold and frankincense." Only last month a well-educated American girl, aged 17, said to the present reviewer: "*Who's Who?* Oh, that's the book you pay $25 to get into, isn't it?" So, if for no other reason —and there are several more—this biography of *Who's Who in America* was worth writing. It shows that, up till now, the Big Red Book has been a disinterested compilation, and that, despite the liberalizing of admission policy in the last decade, surprisingly few lightweights are included. It also throws light on the all-important question of the quality of our population.

The author is a psychologist who has studied gifted children and leadership. He claims there are few books so full of human interest as *Who's Who*—a claim borne out by most of this meticulous book-profile. It surveys a mass of detail, which is ably condensed; but five or six chapters could have been shortened by half. There are a few inaccuracies, due to poor proofreading, and there is only a name index; the wideness of Cedric Larson's comments merits a subject index as well.

The most absorbing chapters to eugenists are those dealing with heredity, immigration, women, and education. The first chapter quotes Galton (called, unfamiliarly, "Dr." instead of "Sir Francis") defining eminence: "When I speak of an eminent man, I mean one who has achieved a position that is attained by only . . . one person in each 4,000." Evidently the ratio of selection in Volume I of *Who's Who in America* (1899) was more than twice as strict as Galton's, being only one in every 8,695. The ratio in the last three biennial volumes (1954-1959) was about one per 3,400. The "national glory highway" becomes wider each two years, and it is probable that the proportion of three in ten thousand may become appreciably larger in the next half-century.

It will remain true, however, that the prominent are the nation's chief human resource, and that, in the words of Stephen S. Visher, "the constructive contributions of a small fraction of one per cent of the total world population have made possible civilization's advances." And it is also true that, in the United States no less than in England, distinction runs in families.[1]

The chapter on the foreign born underlines the value of certain kinds of immigrant, as seen in the pages of *Who's Who.* An analysis made in 1940 shows that Canada now sends the largest number of "notables"—roughly 23 per cent, followed closely by England (19 per cent). Then comes Germany (12 per cent), Scandinavia (7.7), Russia (7),

[1] F. A. Woods M.D.: "Heredity and the Hall of Fame," Popular Science Monthly, May, 1913, pp. 445-452: ". . . our much vaunted American equality, liberty and opportunity have done nothing to make distinction in this country any less of a 'family affair' than in the older civilizations of Europe."

Scotland (5.5) and Ireland (3.8). Considering the small population of the Scandinavian countries, Scotland and Ireland, the proportion of their descendants in *Who's Who* is amazingly high.

The older and involuntary immigration which brought the Negro to North America is discussed in Chapter II, "America's Tenth Man." Eminent Negroes have not yet reached even one-twentieth of the number due their proportion in the total population, but their numbers are steadily increasing.

Another group which was under-privileged in the nineteenth century—women—is discussed in Chapter 16. In the early editions of *Who's Who in America* there were about 960 women listed—a proportion of about one to twelve men. Over half of these were authoresses, and only 15 per cent had had college education, which is not surprising in 1899. In the 1948-49 edition there were 2,409 women listed, and of these only 22 per cent were writers; 45 per cent were educators, and estimates are that over 70 per cent had been to college. The married percentage had risen from 54 per cent in 1902 to 61 per cent, of whom 41 per cent did not report any children—as against only 15 per cent of childless married women in the general population. Larson reports on two studies[2] which analyze the fecundity of women in *Who's Who*. In 1928 the average number of children per married woman was 1.12, and twenty years later it was practically identical—1.2. Again, among the women in *Who's Who* only 3 per cent reported five or more children, whereas 25 per cent of the married women in the general population are here reported as bearing five or more children. (p. 309)

It might be interesting to compare with these figures a small study of graduate wives which was made in Britain in 1953.[3] This shows that wives with Degrees who married between the ages of 25 and 29 and had been married between 15 and 25 years had an average of 2.6 children, as against 1.7 children of similar aged wives in the general population in Britain. A further analysis of these graduate wives (admittedly a small sample) found that those holding First Class Honors Degrees (72) had more children than those with Third Class Degrees (104): 2.32 as against 2.15—surely an example of "To her that hath shall be given," and a great encouragement to eugenists!

Another figure which emerges from the studies of women in *Who's Who in America* is that the highest proportion of unmarried women came among the holders of Master's and Doctor's degrees—a statistic which would undoubtedly be reproduced in England. However, one cheerful bit of information is ferreted out: the able women in *Who's Who* who do marry tend to keep their husbands alive longer than average women. It might make husbands of *Who's Who* women good insurance risks; and it will certainly be interesting to see what statistics emerge from the first *Who's Who of American Women*, which came out last year. The proportion of women who accomplish something of national or regional importance without sacrificing family life will probably rise with each succeeding volume.

The chapter on education gives fascinating information, much of which is implicit but some arresting. The neces-

[2]Persis S. Cope: "The Women in *Who's Who*: A Statistical Study," *Social Forces* Dec. 1928, pp. 212-223. C. V. Kiser & N. L. Schacter: "Demographic Characteristics of Women in *Who's Who*," *Milbank Memorial Fund Quarterly*, Oct. 1949. pp. 392-433.

[3]Judith Hubback: *Wives Who Went to College*. London: Wm. Heinemann Ltd. 1957.

sity of higher education for distinguished achievement is generally admitted, and as Larson says, the United States can ill afford not to provide a college education for the able young men and women whose potential would not be realized without it. In Britain since the war there has been a determined attempt to "democratize" Secondary as well as University education.[4] The proportion of University students on scholarship (full Government grant) in Britain ranges between 95 per cent at many provincial universities to about 70 per cent at Oxford and Cambridge. This means that the proportion of "lost ability" through lack of higher education is steadily diminishing in Britain. The older universities are increasing rapidly, and new colleges and University Colleges are being found almost biennially.

The two most striking and probably most valuable analyses in Larson's book are in the chapter on education. First, in two lucid paragraphs he shows that more leaders, in proportion, come from the smaller than from the larger colleges: "Institutions with . . . enrollments of less than 300 . . . could report almost four times as many *Who's Who* biographees per member of the student body as the largest and richest educational institution. . . . The high standing of the smaller colleges is apparently due to the type of well-rounded education provided. There is no other obvious factor." This is a fact which should be pondered by everyone responsible for determining the size of public and private colleges. If the small ones really do a better job, why allow the already-too-large ones to expand?

The second illuminating analysis shows that the private secondary schools have a value out of all proportion to their size. Larson shows what a loss the nation has suffered in the demise of many private schools in the last three decades. Again on the *Who's Who* evidence, the private schools are producing four times as many leaders on a per capita basis . . . as the public schools; and the more scholarships a school provides, the more leaders it produces. Larson states that the Education Service run by *Who's Who in America* has, besides helping parents to choose schools, fostered the growth of scholarships. This is a real service, as indeed is any activity which fosters the development of leadership. If the kind of successful man and woman represented in the pages of *Who's Who in America* is found to be largely produced in small colleges and private schools, public opinion might well demand help for them from the government, under suitable safeguards.

In writing this book the author has performed a service both to the large organization which produces *Who's Who in America* and to the community at large. His scrutiny is careful, shrewd

[4]The present controversy about the need for "Comprehensive" as against Grammar Schools is motivated at base by the need to foster more talent of all kinds. At present there are about 55 Comprehensive schools in Britain—a new development since the 1944 Education Act. These are roughly equivalent to the American High School, in that all children enter the Comprehensive School from primary school after the age of 11 without exams. The British Grammar School (often an ancient foundation, but there are many new ones) teaches children from 11 to 18 and gives an academic education, preparing for college. It is to them, in districts where there are no Comprehensive Schools, that children who have passed the "Eleven-plus" exam go; those who fail go to Secondary Modern Schools or Technical Schools. This examination, which "streams" children at the tender age of eleven, is gradually being replaced by teachers' reports and school reports; and it remains to be seen how far the Comprehensive School (within which streaming takes place) will replace the Grammar Schools. There is room for both in the highly organized and elastic British education system.

and often wise. He does not take the criteria of success in our culture for granted and stresses more fundamental values, insofar as they can be identified in *Who's Who.* His ultimate concern throughout is not with "success" but with personal quality. It is a concern we all should share, for on the ability of the United States and Europe to produce leaders of the right caliber may hang the future of our civilization.

BARBARA SCHIEFFELIN BOSANQUET

A CROWDING HEMISPHERE: POPULATION CHANGE IN THE AMERICAS (The Annals of the American Academy of Political and Social Science, vol. 316, March 1958): Edited by Kingsley Davis. pp. vi, 136. $2.00.

Editor Kingsley Davis's judicious enlistment of contributors has produced an unusually distinguished volume, theoretically and substantively, to which it is difficult to do justice in a short review. The seemingly incongruous lumping together of highly developed Anglo-America and underdeveloped Latin America results in the discussion of a number of crucial theoretical problems of comparative demography within the manageable empirical limits of two relatively homogeneous culture areas. Since it is impossible to discuss each paper individually, this review will be limited to two topics which can be traced through most of the papers, namely (1) prospective natural increase, which can be resolved primarily into the relative responsiveness of mortality and fertility to internally and externally generated forces of social change, and (2) the extent to which relationships projected for the Western hemisphere can be generalized to other areas.

As is well known, Canada and the United States have experienced an increase in natality since the war. Their birth rates are of course low by hemispheric standards. Latin American birth rates are high (estimates for many countries running as high as 45 and in some cases even 50 per 1,000), and there is evidence that they have also risen. Tietze, Stolnitz, and Roberts seem to lean toward the conclusion that not all of the apparent rise is due to improving registration. If their suspicions are correct, this underscores the importance of remembering that even high birth rates can go higher. Anglo-American mortality is now so low that future growth depends mainly on the course of fertility, which has behaved in a disconcertingly unpredicted manner. Recent changes in U. S. and Canadian cohort fertility are described in an elegant paper by Ryder, who is also to be congratulated for re-emphasizing the importance of currently unfashionable economic factors. However, his suggestion of a direct correlation between per capita real income and planned cohort fertility seems a bit over-simplified. I suspect that past economic experience and future expectations will turn out to be vitally important, and that real cohort treatment will be needed on the economic side also.

South of the Rio Grande it is mortality which is currently the main determinant of natural increase, and Stolnitz finds that the *smallest* decline observed in the countries for which he has data "ranks with the maximum trend observed in any Western nation at any time during the last century and a half." (p. 95) Tietze anticipates that present rates of natural increase of around 25 per 1,000 may "soon" rise to 30 or more in the absence of significant declines in fertility, which he doubts will occur in

the next decade. The prospects are thus for a continuance and possible acceleration of rates of growth which already surpass those of any other major region of the earth. The burden of evidence is that while in the U. S. fertility declined faster than mortality during most of the demographic transition, mortality is proving vastly more responsive in Latin America. The question is, why?

Urbanization and industrialization are usually assigned the role of key variables in the reduction of both mortality and fertility. Stolnitz argues persuasively that mortality has broken loose from these forces of internal change and can now be introduced externally with a minimum of cost and alteration in the basic structure of the benefiting society. Tietze contends that the immediate impact of urbanization, industrialization, and literacy has been limited by the recency of these developments and by strong class barriers to diffusion, particularly in countries with large aboriginal populations. Harrison Brown sees two distinct time scales, a rapid one for social changes which can be implemented by a small number of persons (which would certainly include the control of epidemic and infectious diseases by the latest methods), a slow one for changes requiring the participation of large populations, such as agricultural development and birth control. Under Latin American conditions, urbanization seems on the one hand to be less dependent on industrialization (this is suggested by excessive expansion of employment in services) and on the other hand to have less immediate impact on fertility than observed in Anglo-America.

This brings us to the question of the generalizability of Latin American experience. Davis is impressed by the fact that Latin America is the only underdeveloped agrarian region which has "the advantage of both a European background and a new and relatively empty territory. This fact helps to explain why it has been easier to transmit to them the modern techniques of death control." (p. 7) It may be equally important to note that while death control can be readily introduced by officials of predominantly European culture, fertility control in many countries requires the cooperation of the large substratum of non-European population. Moreover, even the European ancestors of present day Latin Americans mostly originated in the less "Westernized" areas of Europe. It is scarcely an accident that colonists of Southern European culture established themselves successfully in the tropical regions of Latin America where present growth is highest. It would be interesting to explore the hypothesis that the demographic transition as we know it in nations in the temperate zones may undergo a transformation as it moves into the tropics.

LEIGHTON VAN NORT
Princeton University
and Bowdoin College

URBANIZATION IN ASIA AND THE FAR EAST —Proceedings of the Joint UN/UNESCO Seminar, Bangkok, August 8-18, 1956: Philip M. Hauser (Editor). Tensions and Technology series, UNESCO Research Centre on Social Implications of Industrialization in Southern Asia, Calcutta, 1957, 286 pp., $1.20.

This publication is divided into two parts. Part I contains the Summary Report of the General Rapporteur, Professor Philip M. Hauser and the Conclusions of the Seminar. Part II contains 9 papers, 4 prepared by various depart-

ments of the United Nations, 2 by the ECAFE Secretariat, 1 each by the UNESCO and the ILO. Professor Hauser contributes the remaining paper. The economic, social and physical problems of urbanization in this region have been considered in considerable detail in these papers. Among economic aspects, attention was directed to over-urbanization in Asia and the rural-urban migration and factors influencing it. In the discussion of social problems, adjustment problem of the immigrant, the effect on the family, social disintegration, crime and delinquency, labor problems, traditional arts and crafts and education were considered. The physical environment, housing, community improvement and building, and physical and environmental planning are discussed under physical aspects. The discussion is very comprehensive and stimulating.

As it is not possible to do justice to the whole of the rich material contained in this publication within the space allotted to this review, I will mainly focus my remarks on the economic aspects, but that should not be taken to mean that I regard the others as of less importance.

In Professor Hauser's general report, as well as in his paper and in some other papers in this publication, there seems to be general agreement on the idea that this region represents a case of over-urbanization. To quote Professor Hauser, "At comparable levels of urbanization, the developed countries of today had a correspondingly greater proportion of their labour force engaged in non-agricultural occupations. In that sense, Asia can be said to be relatively over-urbanized. The pace of urbanization, especially in the last decade, has far exceeded the growth rate of economies of Asia" (p. 9). This has been tied up with the observation that the migration to urban areas in Asia has been predominantly due to the "push" of unemployment and poverty in the rural areas than to the "pull" of industrial and other employment opportunities there (p. 133).

Both these observations, in my opinion, need to be examined much more critically than has been done so far. In the definition of over-urbanization quoted above, two things are being combined and compared—the percentage of the total population living in urban areas and the distribution of the labour force as between agricultural and non-agricultural occupations. The first is a spatial distinction without being an occupational one, and the other is the opposite of this. There are non-agricultural occupations in rural areas and agricultural occupations in urban areas, and so all the rural-urban migrations do not always and necessarily mean an occupational migration as well. Over-urbanization of the above-described type would arise because the urban areas there contain relatively a higher proportion of agricultural occupations than that to be found in the European urban areas in the period for which comparisons are made. This kind of "over-urbanization" is different from the "over-urbanization" that is said to result from rural pressure exploding into urban growth, the urbanization due to the "push" rather than to the "pull." This, therefore, needs to be clearly distinguished.

Of course, the "pull" and the "push" themselves are not above board. It is often difficult to separate the causes of migration into these two neat and separate categories. They may be also related to one another. There is no "pull" (a better place to go to) without a "push" (bad conditions at home) and vice versa. The push and pull would

appear to be simplifications useful for certain purposes but not as the basis of further building of major analyses. All I want to suggest is that this phase of the analysis needs to be examined much more thoroughly and critically than has been done so far, before major analyses are developed around them.

N. V. SOVANI
Visiting Lecturer
Department of Political Economy
The Johns Hopkins University

POPULATION AND WORLD POLITICS: Philip M. Hauser (Editor). Free Press, Glencoe, Ill., 1958, 297 pp., $5.00.

This volume comprises selected public lectures and the papers introducing Roundtable discussions of the Thirteenth Institute of the Norman Wait Harris Memorial Foundation held at the University of Chicago, November 24-28, 1954.

Part I dealing with "World Population and Resources" contains three papers by Durand, Notestein and Woytinsky. Part II on "Population, Levels of Living and Economic Development" has four papers by Kuznets, Hagen, Thomas and Spengler. Part III discussing "Population Policy and Politics" comprises four papers by Davis, Lorimer, Taeuber and Wright. There is a short introductory chapter by Professor Hauser besides.

Population directly and indirectly affects the process of economic growth. Since "World prosperity is indivisible" the population factor has relevant implications for international politics. If the enlightened economic self-interest of developed countries initially led them to take interest in and actively assist the process of the economic development of the under-developed countries, their political self-interest has of late tended to grow with the result that economic aid has become a powerful competitive instrument in the East-West struggle for winning the uncommitted populations to their side. One often fears that the political interest may sometime eclipse the economic interest. The discussion of this aspect in this publication is naturally not up to date as much has happened since these papers were written. But most of the issues involved and their background would be found touched upon in this volume.

International migration is very much governed by political considerations and has important political implications. How national policies regarding population are largely determined and influenced by considerations of international politics is very well brought out by the papers of Davis and Taueber. On the other hand, Wright, specifically discussing American foreign policy, concludes that "the population movements affecting American foreign policy most significantly are not those in the United States itself but those in other countries."

On the whole this volume contains much valuable discussion and is to be highly recommended.

N. V. SOVANI
Visiting Lecturer
Department of Political Economy
The Johns Hopkins University

BIRTH CONTROL AND CATHOLIC DOCTRINE: Alvah W. Sulloway; preface by Aldous Huxley. Beacon Press, Boston, 1959, xxiii + 257 pp., $3.95.

Over the past half-century American Catholics have written often and extensively on the subject of "birth control," whether this be understood as positive

contraception or as periodic continence ("rhythm") within the marriage relationship. That much of the writing was occasional in nature (pamphlets, leaflets, short articles in weekly papers or general magazines) makes neither for easy compilation nor ready analysis. Discovery of underlying attitudes and conviction is complicated further by the fact that controversy, both within and outside the Church, and manifestly apologetic objectives, colored the major portion of the output.

This reviewer neither approves nor defends the logical and/or doctrinal shortcomings of some things which appeared in print under Catholic auspices. Study of the sources has convinced him, as it has the author of the present volume, that consistency in reasoning is not always evident and that hastily drawn arguments from social expediency at times defeated their own purpose. He would point out, however, that the general atmosphere of the era was hardly conducive to scholarly objectivity or balanced discussions of issues surrounding family litigation. Deep human emotions, associated with basic urges and attitudes toward life and society, had been stirred. Many were taking sharp positions for or against *lebensraum* theories, total planning, compulsory sterilization, genocide, and the like.

Moreover, professional disputes in legal, medical, and psychological circles were common even in the mid-thirties. Toward the end of the decade leading demographers and social scientists were predicting decline of the family, proximate stabilization of population, and likely stagnation of the economy. The Catholic Church neither initiated nor participated in some of these disagreements. Certainly it cannot be held responsible for enactment of the Comstock laws, about the interpretation of which controversy was in part concerned. This is the historical fact, whatever be the disapproval of the Church of some practices the laws also condemned.

But during those critical years not all American Catholic writing on the ends and use of marriage was popular in tone. Certain works achieved scholarly and critical levels and endeavored to come to grips doctrinally with issues as the authors saw them. That these writers failed to appreciate fully the dynamics of human fertility as now understood and perhaps minimized unduly or even exaggerated the familial reasons for legitimate child-spacing, again but reflects the thought of the period. Consequent to advances in the social sciences, today's theologians are in a better position to assess the concrete circumstances in which families find themselves. Suitable appraisal of trends in American Catholic thought requires attention to these historical aspects of the matter.

The present book is deficient in this regard, and to significant degree. The principal reason seems to be that orderly content analysis became subordinated to building a brief designed to show the Church in error on a major point of natural law. Actually, what the author demonstrates, is that a number of American writers and apologists put the Catholic case poorly and relied too heavily on contingent social facts and arguments from expediency in discussing family limitation. They would have done better to concentrate on clarification of the metaphysics of human nature and of sexuality, both in their inherent finality and in relation to society. Then they could have kept the social facts where they belong, namely on the level of circumstances, which indeed have moral relevance but which do not determine

the intrinsic morality of naturally specified acts like that of intercourse. Thus would the common teaching have been more faithfully portrayed.

It must be said to the credit of its author that *Birth Control and Catholic Doctrine* contains references to, and a number of quotations from, most of the significant American Catholic writing on the subject during the period in question. The compiler consulted both popular and scholarly sources, including a few non-Americans as well. Even the sampling resorted to of necessity in the case of newspapers and leaflets reflects the general tenor of thought during the crucial years. Moreover, an extensive bibliography and footnotes testify to thoroughness in uncovering sources, though interpretations given at times leave something to be desired from the standpoint of scientific norms.

The basic weakness of the book, however, springs from several underlying assumptions discernible among other places in the *Conclusion* (pp. 156-8). First is that content-analysis of writings, for the most part popular and/or apologetic, in a particular country and era will reveal Catholic doctrine in its totality and with clarity. Second is that the Church as such has erred on a major point of natural law and can be induced to rectify its position.

As regards the first assumption, social scientists generally will be quick to detect the limiting factors in such a procedure when applied to a perennial institution which transcends particular eras and cultures. As regards the second, this reviewer must concede that his own religious faith makes clear to him that the Church does not err in such matters, but he also recognizes that not all share the faith to the same extent as he.

Putting the matter simply but forthrightly, only the Pope speaking solemnly and definitively, or an ecumenical council acting under his guidance, can give final answers to questions of faith and morals wherein the human reasoning process has run into doubt and confusion. Certain aspects of sex morality and marriage doctrine have been, over time, in that category. No particular writer, though a scholar, prelate, or officer in an episcopal secretariat, can claim such authority in presenting or preserving the authentic Christian tradition and teaching. Nor can a limited consensus of such writers or spokesmen, apart from the abiding beliefs of the universal Church, reveal adequately the Catholic doctrine which the present book sets out to discern.

WILLIAM J. GIBBONS, *s.j.*
Department of Political Philosophy and Social Science, Fordham University

INBORN ERRORS OF METABOLISM. D. Y-Y Hsia. The Yearbook Publishers, Inc., Chicago, 1959, 358 pp., $9.50.

In Dr. Hsia's book, "Inborn Errors of Metabolism," attention is directed to those genetic conditions in which a discernible malfunction of one or more biochemical reactions is evident. A very large number of clinical conditions are discussed in 244 pages, and most are by no means simple.

Dr. Hsia has addressed his book to the general practitioner and house officer. The book consists of a brief introductory explanation of basic Mendelian genetics and some factors affecting gene expression. The largest portion of the book consists of a condensed description of the clinical manifestations, physical findings of the diseases, the hereditary patterns, and pathogenesis. With most diseases, a family tree is illustrated and a schema

for relating the biochemical defect to the phenotypic expression, both primary and secondary. The final 50 pages are an appendix detailing specific laboratory tests relevant to the diagnosis or differentiation of the various conditions considered in the text.

Dr. Hsia's book brings together in a single volume information on a large number of familial disorders, with the emphasis on those conditions which are approachable through biochemical techniques. This area of medical research is advancing very rapidly because of the broadened interest in medical biochemical genetics.

The rapidity of these advances is more particularly a reflection of the advances in biochemistry and the recent interest shown in these disorders by many of the leading biochemists. There is an increasing awareness that the study of these "Mistakes of Nature" offers a singular opportunity to study the importance of the biochemical reaction which is deficient in the over-all physiology of man.

The schema which Dr. Hsia has used, relating the genetic transmission and correlating the enzymatic defect, to the phenotypic expression, represents a very good teaching approach.

Due to the brevity of the descriptions, the book could not be considered a reference book. Those interested in a more thorough approach to any particular disease considered therein may find the book a handy source for the bibliography it contains following each condition described. There are errors to be found in a number of the précis. Differences of opinion are sure to arise regarding whether the best method has been chosen for description in the methods section. Each investigator has his own prejudices regarding methods. As a matter of preference this reviewer would have preferred that the title, "Inborn Errors of Metabolism" be reserved for Sir Archibald Garrod's monograph which was a distinctive milestone in genetic history.

JAMES B. SIDBURY, JR., M.D.
The Johns Hopkins Hospital

Periodical Reviews

GENETICS

The somatic chromosomes in mongolism. P. A. Jacobs, A. G. Baikie, W. M. Court Brown, and J. A. Strong. *Lancet*, **7075** (1959), p. 710.

In a very important paper, the authors report the results of cytological studies carried out on 6 individuals (3 males, 3 females) with typical mongolism. The diploid chromosome number for all 6 individuals, as determined by a study of bone marrow cells, was 47. This agrees with the number given for 3 mongols by Lejeune, Gauthier, and Turpin (1959, *C. R. Acad. Sci.* Paris 248, 602). Since the normal chromosome number in man is now accepted to be 46, these findings show that mongolism is associated with a trisomic condition. The evidence suggests that the extra chromosome is a small autosome.

This discovery by these authors may resolve the controversy concerning the etiology of mongolism. A positive correlation between age and the frequency of non-disjunction of a specific pair of autosomes in females (resulting in $n + 1$ eggs) could explain the higher incidence of mongols born to older mothers as compared with younger mothers. The trisomic condition due to non-disjunction would also account for complete concordance in monozygotic twins and near complete discordance in dyzygotic twins, the usual negative history of the condition in sibs and ancestors of propositi, and the observation that some female mongols have produced a mongol child.

The chromosomes in a patient showing both mongolism and the Klinefelter syndrome. C. E. Ford, K. W. Jones, O. J. Miller, U. Mittwoch, L. S. Penrose, M. Ridler, and A. Shapiro. *Lancet*, 7075 (1959), pp. 709-710.

Individuals with the intersex condition known as Klinefelter's syndrome are known to possess buccal mucosal cells with the Barr chromatin body and leukocytes with dumbbell appendages. This chromatin positive characteristic occurs when two X chromosomes are present in the cells, such as in normal females. Jacobs and Strong (*Nature*, 183 (1959) pp. 302-303), by a study of bone marrow cells, demonstrated that the chromosome number in one person with Klinefelter's syndrome was 47. They concluded that the increase in number is due to a sex chromosome complement consisting of two X chromosomes and a Y chromosome.

An individual was studied by the authors who exhibited the morphological features of both Mongolism and Klinefelter's syndrome. A cytological study of this individual presented a unique possibility for testing the hypothesis that mongolism is due to a trisomic condition for one of the small autosomes (see previous abstract) and that Klinefelter's syndrome results from an XXY sex chromosome complement.

The hypothesis was supported in every detail. The chromosome number in the bone marrow cells was clearly 48. A trisomic condition was present for one of the autosomes, and a Y chromosome was found in addition to two X chromosomes.

The authors point out that this is the first time that a human being has been described with two supernumerary chromosomes and it is remarkable that his general health should be so satisfactory.

A sex-chromosome anomaly in a case of gonadal dysgenesis (Turner's Syndrome). C. E. Ford, K. W. Jones, P. E. Polani, J. C. de Almeida, and J. H. Briggs. *Lancet*, **7075** (1959), pp. 711-712.

The authors report the results of a cytological study carried out on a 14-year-old girl showing Turner's syndrome. This clinical syndrome is characterized, in the main, by failure of secondary sex characteristics associated with rudimentary, or absence of, gonads, and very often, certain congenital malformations.

The patient was chromatin negative for the Barr chromatin body in the skin cells and dumbbell appendages in the leukocytes. This characteristic is typical of normal males. Cytological examination of the bone marrow cells showed a chromosome number that was 45. In a normal male, 5 small acrocentric chromosomes are present, consisting of 2 pairs of autosomes and the Y chromosome. In this patient only 4 of these chromosomes were observed. A normal female has 16 metacentric medium-length chromosomes including 7 pairs of autosomes and 2 X chromosomes. The patient in question only had 15 of these chromosomes. The authors conclude that these observations suggest strongly that the patient possesses a normal complement of autosomes, a single X chromosome, and no Y chromosome.

The XO constitution found in the individual could have arisen from non-disjunction of the X chromosome during formation of the egg, resulting in a no-X egg which was fertilized by an X-bearing sperm, or it could have arisen from non-disjunction during the formation of a male gamete resulting in a sperm cell without a sex chromosome. The end result was a chromatin-negative individual with Turner's syndrome who is a female anatomically and psychologically, but who failed to develop normally.

Studies on the genetics of leukocyte antigens. P. Lalezari and T. H. Spaet. *Blood*, **14** (1959), pp. 748-758.

Although the antigenic differences among erythrocytes is one of the most extensively studied aspects of human genetics, little work has been carried out in regard to leukocyte antigens. It is known that patients can develop agglutinating antibodies against donor leukocytes as well as erythrocytes.

The authors obtained serum leukoagglutinin activity from patients who had received multiple blood transfusions. The serum from each person was then tested with leukocytes prepared from six pairs of monozygotic twins. It was noted that a similar leukoagglutination reaction occurred for both members of a pair tested with the same serum, while some differences were observed between members of one pair of dizygotic twins. This demonstrated that leukocyte antigens are inherited. These antigens are apparently not related to erythrocyte antigens.

Serum from seven of the individuals was then tested with the leukocytes from immediate family members. These family studies showed that multiple antigens are present. A simple genetic pattern for a specific antigen could not be demonstrated. For this reason, the time is still in the future when leukocyte antigens will be useful in linkage, medicolegal, and population studies.

The co-brother method in clinical genetics: tuberculosis research. L. Gedda and S. Volta. *Acta Geneticae Medicae et Gemellologiae*, **8** (1959), pp. 70-74.

In a new approach to the study of the

hereditary aspects of tuberculosis, the authors surveyed the records of all patients treated in a sanatorium in Rome during a 23-year period and searched for non-twin pairs of brothers. A total of 736 pairs was found. As control pairs, they collected 200 other patients coupled at random. For each patient they compiled a medical history including such items as age of onset of the disease, location as to side and lobe, presence of fever, cough, expectoration, hemoptysis, etc. A comparison was then made of the similarity and dissimilarity of the pairs of brothers and control pairs in regard to these characteristics.

The conclusions of this study were that many of the characteristics can be influenced by heredity, such as localization, age of onset, and classification as to form and cause. Of special interest was the localization aspect. The brothers were similar in regard to side and lobe involved in 71 per cent of the cases while in the controls, similarity only occurred in 34 per cent of the cases.

The authors propose that the co-brother method of investigation can be a very informative approach in studies of clinical genetics.

CHARLES M. WOOLF
Laboratory of Human Genetics
University of Utah

POPULATION

Effectiveness of an oral contraceptive. Gregory Pincus and others. *Science.* **130,** 3367 (10 July 1959), 81-83.

In three projects in Puerto Rico and one in Haiti a norethynodrel-estrogen combination was administered as an oral contraceptive to 830 women for a total of 8133 menstrual cycles. In all projects a regimen of one tablet a day from the fifth through the twenty-fourth day of the cycle was followed. Regular visits to each subject, and physical examinations and laboratory tests of a representative sample, furnished information on conceptions, menstruation, and possible "side reactions." The pregnancy rate for the group studied was reduced from a premedication level of 61.2 pregnancies per 100 women-years to 2.7, all of the certain pregnancies occurring to women who missed taking one or more tablets.

The author concludes that the medication used is contraceptively effective; causes no significant abnormalities of the menstrual cycle; has no adverse effect on the reproductive tract and adnexae; has no physiologically adverse effects generally; has no adverse effect on the sex life of the subject; does not impair fertility after cessation of medication; may be used in a low dosage; and is acceptable to users, but to an extent that varies with motivation, economic situation, and other factors.

Students of population problems will recognize in the last finding, the importance of motivation, a familiar problem and one that will require further research. Information on costs, not included in the article, would help to round out the reporting of this significant experiment.

Population problems and the control of fertility. Hudson Hoagland. *Daedalus: Journal of the American Academy of Arts and Sciences.* **88,** 3 (Summer 1959), 425-443.

The work reported by Pincus in the article noted above is placed in demographic context by Hoagland, who reviews the chief features of population growth of recent centuries—notably the reduction of mortality—and points to the use of oral contraceptives as a possible solution to the problems implied

by low mortality rates. Hoagland proceeds to a summary of research findings in this area, emphasizing the Caribbean experiments of Pincus and his associates. The findings reported agree with those cited by Pincus except in one respect: whereas Pincus records (p. 81) "no significant change during medication cycles in the reported incidence of pain associated with menstruation," Hoagland states (p. 437) that "painful menstruation . . . was considerably decreased during the periods of medication."

The article concludes by inquiring as to the implications of the findings in relation to problems of overpopulation. Though manufacturers and many physicians believe that more data are necessary before there will be assurance that substances of the sort tested have no adverse effects when used over very long periods, Hoagland believes that "those concerned with human welfare may well hope that these or related substances may come to play a significant role in the control of world population" (p. 471).

The Catholic position on population control. John L. Thomas, S.J. *Daedalus: Journal of the American Academy of Arts and Sciences.* **88**, 3 (Summer 1959, 446-453.

Protestant ethics and population control. John C. Bennett. *Ibid.*, 454-459.

The issue of *Daedalus* in which the Hoagland article (above) appears is organized in terms of "Current Work and Controversies." As a sequel to Hoagland's discussion the editors present statements of Roman Catholic and Protestant views with respect to population control. The disagreement between the two positions, as presented here, is not concerned with whether control of population size is to be allowed—for both hold that it is—but with the permissible means of control and the moral basis for their permissibility. Whereas the Roman Catholic position emphasizes positive laws of behavior found by the use of reason, the Protestant finds "no *cumulative* body of moral laws related to specific situations by means of a tradition of casuistry" and is "without much concrete guidance on specific dilemmas" (p. 454). Both the Catholic and Protestant writers believe that marriage should normally involve parenthood (pp. 447, 457). Both agree that the sexual act has two functions: procreation and the manifestation of love between the partners. In the Catholic view, however, propagation of the human race is presented as the principal purpose for which the sexual act exists, with the manifestation of love a further function; whereas the Protestant view finds the second function of equal importance and not to be subordinated to the first. Whereas for the Catholic the use of contraception is "contrary to the right order of reason" (pp. 448-449), for the Protestant it may "be morally wrong to advise a married couple to refrain from intercourse for long periods" (p. 456) and the use of contraception may be a duty for many people.

As a solution for the world population problem, Protestants find the use of contraception not only acceptable but mandatory. Roman Catholics consider contraception an ineffective and piecemeal reform and emphasize the need for social and economic changes. "In regard to the over-all problem of world population *vs.* world resources, they [Roman Catholics] maintain that our answers must remain highly speculative" (p. 457).

GEORGE F. MAIR
Smith College

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